

January 18, 1960

Aviation Week and Space Technology

Editorial Staff

A. McGraw-Hill Publication

Four Horsemen Begin C-130 Bomb-Burst

C-130 Team
Flies Air Show
Formations





PRESCRIPTION FOR WEIGHT CONTROL...

Wei-Shan weight/master hex nuts combine a considerable savings in weight together with a carefully engineered design that meets the needs of a wide range of industry requirements.

Well-known, Wei-Shan experience quality control and production methods assure a consistent high reliability and effectiveness whenever weight/master is specified. Excess metal has been removed without loss of full performance.

weight/master hex nuts



Now in quantity production in sizes #4-40 through 15-24, the weight/master hex nut is anticipated as a successful answer to weight control and performance problems. Weight/master hex nuts have passed stability-verified qualification tests and may be procured under the following part numbers:

CROSS REFERENCES		WEIGHT/MASTER	
WE PART #	BSI #	AS #	WE #
WE 301040	BSI 121030	AS 1210 04	6-40
WE 301042	BSI 121032	AS 1210 04	6-40
WE 301043	BSI 121033	AS 1210 04	6-40
WE 301045	BSI 121035	AS 1210 04	6-40
WE 206402	BSI 121042	AS 1210 04	1440
WE 206403	BSI 121043	AS 1210 04	1440
WE 206405	BSI 121045	AS 1210 04	1440
WE 301050	BSI 121050	AS 1210 04	4800
WE 301055	BSI 121055	AS 1210 04	5000

For information on these and other Wei-Shan fastening products write to:

VOI-SHAN

VOI-SHAN MANUFACTURING COMPANY
2440 Higuera Street, Santa Clara, California

HERE'S SKID PROTECTION



Basic units of the Goodyear Anti-Skid System—specified for the Convair 880 and Republic F-105. Installed on a 2-wheel fighter, the system weighs under 6 lbs.

1 FIRST, CONSIDER THIS—As safety high priority, the Goodyear Anti-Skid System is two systems. Sealed units that are well below cost—outfitting plant and personnel training costly down-time that can wreck flight schedules. The anti-skid element of course—can be aware of damage until use time.



2 TO ANSWER THE PROBLEM—Goodyear offers three types of anti-skid systems. **Skid Warning Zones** instantly stop the pilot's inadvertent free-wheel skid, keeps control. **Anti-Skid Zones** automatically release to take pressure off the stops but prevent skid or skinned touchdowns. **Pilot-Operated Anti-Skid System** is remote control of either one. Provides continuous full pressure yet allows pilot control of wheel.



3 PROOF OF EFFECTIVENESS—Goodyear's Skid Warning Zones—specified for both the Convair 880 and Republic F-105. Goodyear Anti-Skid Warning Zones immediately stop the pilot's inadvertent free-wheel to reduce cost and downtime. DASH 14A approved for Republic DC-7B and DC-7C aircraft. Goodyear Pilot-Operated Systems—new proof of safety in one of the most industry jets.



4 FOR DETAILS—Information on Dash 14A, Skid Warning Zones, and specific facts that will help you decide which system is best for your specific Goodyear, Republic F-105s, Convair 880s, Douglas, Alenia 36, or Los Angeles 34, California.



AVIATION PRODUCTS BY

GOOD **YEAR**



New Series of Small, Light Radio Interference Filters. For info, circle 7 on card.

New Series of Small, Light Radio Interference Filters

The new cylindrical-style radio interference filters recently announced by Sprague Electric Company are the smallest and lightest filters of their type available for military and industrial electronic and electrical equipment. Their basic design was pioneered by Sprague in order to achieve maximum miniaturization.

This new series of standard filters is believed to be the most compact in the industry, ranging in current rating from 5 amperes to 50 amperes covering the majority of applications.

The natural shape of the rolled capacitor section and of the toroidal inductor dictated the cylindrical form. All filters have threaded-neck mountings designed to give a firm metallic contact with the mounting surface over a closed path enclosing the filtered line and to eliminate unwanted contact resistance so that the theoretical effectiveness of these units is realized in practice.

Typical insertion loss is determined by measurements made in conformance with Military Standard MIL-STD-225. Minimum curves for specific filters are available upon request.

For assistance in solving unusual interference, noise, or space problems, contact Interference Control Filter Service Manager, Sprague Electric Co., 12800 Pines Street, Los Angeles 46, California; 224 Lao Street, Dayton 4, Ohio; or 327 Marshall Street, North Adams, Massachusetts.

AVIATION CALENDAR

(Continued from page 5)

Mar. 9-11—Conferences on the Mechanical Properties of Engineering Ceramics, North Carolina State University, Raleigh, N.C. Sponsored by North Carolina State College School of Engineering, Office of Defense Research, U.S. Army.

Mar. 10-13—National Flight Propulsion Meeting (sponsored by the Institute of the Aerospace Sciences), Cleveland, Ohio.

Mar. 17-18—Stresses Design and Testing Symposium, Department of Defense, Washington, D.C. Sponsored by Department of the Navy Bureau of Naval Weapons.

Mar. 23-24—Conference of Radio Engineers' Instrumentation Corporation, Waldwick, New Jersey and Calverton, New York, N.Y.

Mar. 23-25—Symposium on Optical Spectra and Measurement of High Temperatures, University of Connecticut, Storrs, Connecticut. Sponsored by Chemical Specialties Laboratories, Jeannette Glass Co., National Science Foundation.

Mar. 24-25—First Annual Symposium on Human Factors in Electronics, New York, N.Y. Sponsored by Institute of Radio Engineers, Institute of Electronics and Human Factors in Electronics.

Apr. 4-6—Fourth Conference, Construction and Propulsion Panel, Advisory Group for Aerospace Research and Development (AGARD), Paris, France. Sponsored by High-Speed Number Aerodynamics Division.

Apr. 5-6—1966 National Aerospace Meeting and Vehicles and Aircraft Exposure and Design, Society of Automotive Engineers, Cranbrook, Cranbrook, Head, New York, N.Y.

Apr. 6-8—Stresses Design of Space Vehicles Conference, Sheraton Hotel, Santa Barbara Calif. Sponsored American Rocket Society's Structures and Materials Committee.

Apr. 14-16—1966 National Meeting, Hypersonic and Space Fluids, Institute of Environmental Sciences, Silverado Hotel, Silverado, Calif. Los Angeles Calif.

Apr. 18-19—International Symposium on Aeronautical and Space Materials, Sprague Engineers' Products Sales Corp., New York, 20 W. Sprague Parkway, Department of Defense Research Associate, Institute of Radio Engineers.

Apr. 20-21—National Symposium on Vibration and Space Structures, Institute of the Astronomical Sciences, Antiochian Head, Los Angeles Calif. Sponsored NASA, the Ford Corp.

Apr. 21-23—Seminar, Metals & Materials for the Space Age, American Institute of Metallography and Petroleum Engineers, Antiochian Head, Los Angeles.

Apr. 27-28—National Meeting on Space Age Materials, Committee Chapter of the American Society for Metals, Sheraton-Chesterfield, Chesterfield, Ohio.

Mar. 2-4—National Aerothermal Meeting on Conference, Edinboro and Miami Park, Herkules Division, Ohio. Sponsored by Institute of Radio Engineers, Professional Group in Aerothermal and Navigation Electronics.



Boards Pressure Transducers

SUBMINIATURE SIZE

HIGH RELIABILITY

These rugged, miniaturized instruments weigh less than 4 ounces. Nevertheless, each unit is built to the same uncompromising standards that have won a distinguished record of reliability. At ± 300 vibrations, these compact instruments deliver a high level, low noise, noise-free signal. Available in absolute or gauge pressure versions, over a wide pressure range, the 480 and 700 lines will meet your most exacting performance and reliability requirements. These units, with a wide selection of mounting, pressure sensing and electrical connections, illustrate Bourns' ability to translate the most stringent requirements into high-performance transducers you can depend upon. They prove the statement—*It's better to be smaller... it's better to be Bourns*.

Specifications

	Model 480	Model 700
Pressure range	0 to 200 psi	0 to 2000 psi
Operating temperature	-40 to +180°F	-40 to +180°F
Static error band	1.0% ± 1.0%	1.0% ± 1.0%
Dimensions	1.0" x 1.0"	1.0" x 1.0"
Weight	4 ounces	4 ounces

Write for complete technical data.



Bourns, Inc., Instrument Division
4180 Northgate Boulevard, Northgate, Calif.
Radio Engineering Division
Huntington Station, L.I. and Dallas, Texas
Please see advertisement elsewhere for positive pressure and acceleration. Exclusive manufacturer of Triplex® Transistors. B-2 Transistors.

Symbol of Progress In the World of Precision



ATLAS PRECISION PRODUCTS CO.

Specialists in the design and production of electro-mechanical assemblies and fine precision gears, differentials and components for use in computer, automotive and aerospace systems of industry and the Armed Services. Atlas gears are certified to meet A.G.R.A. specifications and stocked in pitches from 22 to 120. APPCO units, proven in use in the most difficult precision mechanisms.



MEASUREMENTS RESEARCH CO.

Designers, developers and producers of custom electronic test equipment for quality control, production test inspection and high reliability. Products for these applications are designed to meet the needs of a wide variety of manufacturing firms through application of electronic techniques. Fully qualified for research and development work, equipped for complete production of diagnostic and electro-mechanical units of all types.



ATLAS CHAIN & MANUFACTURING CO.

Wholly owned and exclusively producing power transmission products for all types of industry. Atlas Chain, Chain Wheel and Specialty Chain, Specialty Chain, Sprockets and Flange, and Sprocket Wheel, have earned their commanding position in every type of industry where power or motion must be transmitted. Atlas Chain has planned and put into new construction of the power transmission field and many new developments are now in the R&D rear stage in their extensive research laboratories.

For Prudential Industries and units, write or wire, or call your distributor, or write for complete details to:
Center and Kensington Areas, Philadelphia 24, Pa.

PRUDENTIAL INDUSTRIES

Precision-eers For Industry

Engineers:

Here are sound reasons why
it pays to specify



National Seamless Mechanical Tubing

USS National Seamless Steel Mechanical Tubing offers you extraordinary freedom of design in a wide range of products from bushings to hydraulically operated telescoping booms. And, USS National Seamless Tubing helps cut processing costs, because it eliminates drilling operations; enables you to replace drills with simple, less expensive boring tools; and it reduces tool wear and tool changes; and, more important, more uniform parts can be turned out by the hundreds of thousands.

Where USS National Seamless Tubing is used as a load-carrying member or part, it exhibits a number of structural advantages over other forms. Here are a few: it gives you a superior cross section when a part is designed to withstand equal loading in any direction; it resists bending stresses equally in all directions; it is able to absorb and localize shock; and in torsion, it provides better material distribution, and for a given weight, can withstand more load than other sections.

And, of course, the name USS National is backed by the world's largest and most experienced manufacturer of seamless tubing—National Tube! The production of USS National Seamless Tubing, from one to finished product, is entirely controlled by one organization. There is no divided responsibility. Every foot, every length, is made under the careful supervision of skilled men with years of tube-making experience. For more than 60 years, USS National Seamless Tubing has been built with men who were the best in mechanical tubing.

You'll find USS National Seamless Tubing available at select National Tube Distributors throughout the country. These distributors are strategically located and expertly trained in solving all types of tubing problems. Here, you can choose from a complete range of sizes and stocks. If you'd like to find out how USS National Seamless Tubing can be most effectively applied to your designs, contact your nearest USS National Distributor . . . 5606!

USS and National are registered trademarks.



National Tube
Division of
United States Steel

United States Steel Division, U.S. Steel, Inc., 200 Madison Avenue, New York 10016
Atlanta, Atlanta 33303 • Boston, Boston 02108 • Chicago, Chicago 60611
Cincinnati, Cincinnati 15301 • Cleveland, Cleveland 15201 • Dallas, Dallas 75201
Houston, Houston 77002 • Los Angeles, Los Angeles 90012 • Milwaukee, Milwaukee 53201
Minneapolis, Minneapolis 55401 • New York, New York 10016 • Pittsburgh, Pittsburgh 15222
St. Louis, St. Louis 63101 • Seattle, Seattle 98101 • Toledo, Toledo 43601 • Worcester, Worcester 01652

PROVEN PERFORMANCE
and RELIABILITY...

Contributing to maintenance-free
operation on today's aircraft
and missiles

STRATOFLEX

Teflon[®]
HOSE

"SUPER-T" MEDIUM PRESSURE



SUPER "T-HP" HIGH PRESSURE



Designed for reliability and flexibility at temperatures ranging from -65° to 450° F. Bimetallic "Super-T" and Super "T-HP" Teflon Hoses exceed the rigid requirements of MIL-H-23279 and MIL-H-27074 (ARP 440) respectively. The Super-T hose is available in 1000 psi and 1500 psi, and the Super-T-HP hose is available in 1500 psi to 3000 psi and is used to carry the following fluids: fuels, oils, water, refrigerants, sludges, high pressure gases, as well as liquid gas transfer services. Fittings are made from all corrosion resistant steel as a combination of both carbon steel and corrosion resistant steel. Assemblies are available with straight, 45° and 90° elbows. Other angles are available to your specifications.

Tele 4-7400 (Local)

Write for literature
Dept T
P.O. Box 123
Dallas, Texas
75201
Or Aircraft
Sales
Dept

STRATOFLEX
Inc.

P.O. Box 12300 Fort Worth, Texas
Branch Plant: Milwaukee, Cal., Fort Wayne, Indiana
In Canada: Stratoflex of Canada, Inc.

SALES OFFICES
Atlanta, Georgia
Chicago, Illinois
Cleveland, Ohio
Fort Worth, Texas
Milwaukee, Wisconsin
Milwaukee, New York
Pittsburgh, Pennsylvania
San Francisco, California
Seattle, Washington

Cable assemblies by BENDIX

Specified designs for the most exacting requirements

The versatility of design and reliability of performance offered by Bendix[®] Cable Assemblies results from over a quarter century of previous experience in this field. Our outstanding research and design facilities are avail-

able for custom designed cable assemblies to meet your specialized requirements in each application. Cable assemblies shown are typical Scientific Division developments in cabling for aircraft, electronic and missile applications.



WIRE CABLE This cable is fiberized using both Kevlar[®] (a plastic) and carbon fiber. Strength increases 100% over standard wire cable. Features vital center controlling the layout of conductors.



ENDSCOPE HARNESS Flexible, completely coated and suitable for continuous operation in ambient temperatures of -40° to 140° F. The complete set is highly durable and the wire length allows for any degree of flexible, oblique, in-line or other movements.



COIL HARNESS This nonsparking, reinforced and coated coil is used to reduce heat and complete cable protection. It can easily withstand the severe effects of engine vibrations such as high vibration, high heat.



FUEL CELL HARNESS Safely conducting electrons in fuel cell valves, pressure switches and piping, decreasing current within fuel cell. Features extremely robust and flexible type conductors, double hose protection between current carrying conductors, corrosion proof integral connector shells.



HEAVY DUTY HARNESS Ground support cable assembly built and designed for hard usage at missile launching sites. Heavy duty insulation and a tough exterior tubing insulation to withstand wear.



MISSILE HARNESS Fiberglass tape-wrapped insulation third MIL or Bendix Polymer[®] insulation. Advantages offered by this type of wiring include durability, performance, lightness, plus minimum space requirements.

Bendix & Service, Inc. International Division, 201 E. 42nd St., New York, N.Y. Cover on left via: Aviation Division 100, 200 Lexington Blvd., Newark, N.J. 07102

SCINTILLA DIVISION
STONY POINT, NEW YORK





Marvelous new "eyes" for our defense...through



**hallicrafters*
QRC**

Some dark night, America's defense may well rest upon our ability to "see" what our enemies are up to. This is the urgent mission of Electronic Reconnaissance—simply "eyes" with which we can detect enemy electronic signals, and determine exactly its location, type and capability of the signal source.

Since 1962, Hallicrafters, through its Quick Reaction Capability Program, has been instrumental in the rapid development and continuous improvement of Electronic Reconnaissance systems. Today Hallicrafters QRC is being applied effectively to an increasingly broad area of military electronics, including airborne ECM, communications, SIGINT and missile systems.

Put this dynamic design and production force to work now. From single circuit to complete system . . . for land, sea, air or space application . . . you'll get reliable answers quickly and efficiently.

ENGINEERING: Join our rapidly expanding QRC team now. For complete information address inquiries to William P. President, Director of Engineering.

hallicrafters  **company**

MILITARY ELECTRONICS DIVISION

CHICAGO 24, ILLINOIS

URGENT PROBLEMS RELIABLY SOLVED

NUCO presents the **NEW**

Roto Lock

FLEXIBLE FUEL LINE COUPLING

Tested and qualified
to MIL-E-22014 and other
applicable specifications



Patent Applied For

Four Parts—Installs Without Tools!

(Two single-unit assemblies and two "O" rings)



- 1 Slip 'O' rings onto each end of fuel line.
- 2 Slide Roto Lock Housing onto one side also.
- 3 Snap single-unit clamp shell over standard braided ends of fuel line.
- 4 Slide Housing over clamp shell.

**NATIONAL UTILITIES
CORPORATION**

135 E. Railroad Ave.
Berwyn, Calif.



135 East Railroad Avenue
Berwyn, California
Area 70211

+
Manufacturers of
Gaskets • Couplings • Hoses
Strap Assemblies • Special Devices

Please send complete information about your Flexible Fuel Line Couplings

NAME

ADDRESS

CITY

STATE

ZIP

TELE

TELE



VTOL'S MOST MATURED CONCEPT: THE TILT WING

Seven years of Hiller tilt-wing design study, operations and tests, and successful wind tunnel programs have confirmed to verify the tilt wing as the most predictable and uniformly dependable approach to higher speed VTOL. Hiller's veteran tilt-wing engineering and manufacturing team, first in industry to undertake tilt-wing contracts, and having completed the majority of industry studies in the field, remain avowed champions of this VTOL approach. Their experience continues to insist that operationally practical tilt-wing aircraft, large and small, are ready to satisfy the urgent military and commercial need for VTOL.

Designed to provide the most comprehensive volume of flight test data is the U.S. Air Force X-24, world's largest VTOL project. The X-24 is currently undergoing flight testing at Edwards Air Force Base, Calif.

Designs are not being distributed outside Hiller aircraft firms.

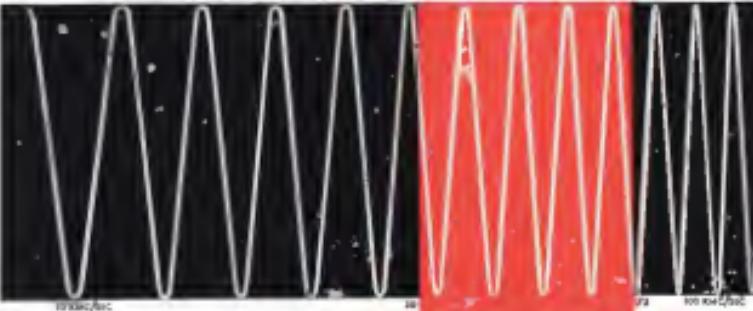
HILLER  AIRCRAFT CORPORATION
PALO ALTO, CALIFORNIA - WASHINGTON, D.C.

Adhesive Engineering Division
San Carlos, California



Now...PHILCO offers the only commercially available fully-tested mixer diode in the

70 KMC BAND



For Long-Range Space Communications and High Resolution Radar Applications

Just declassified! A proven mixer diode that, for the first time, makes useful the 70 KMC high frequency band of the spectrum. The 70 KMC LN702 is a rectifying crystal designed for optimum low-noise performance. The crystal is of internal waveguide construction with the diode mounted in a series of RG-8/U waveguides. It is hermetically sealed for resistance to moisture, dust, and vibration. It is generally used for high resolution radar applications and long-range high altitude or space communications... atmospheric absorption prevents jamming from the ground. The Philco LN702 is also well suited for EHF video detector applications.

The design and application facilities are at your disposal in developing millimeter diodes to meet your specific requirements. For complete information, write Special Components Dept., A/W 103.

Test Frequency: 100000 KMC

	TFP	MAX.	
Noise Ratio, NFR	2.0	2.3	8mm
Conversion Loss, dB	5.4	10	4k
RF Impedance, VSWR	1.25	2.0	
Crystal noise figure, dB	11.5	13	6k



TRANSISTOR
SUBSTRATE
MATERIAL
WAVE
LENGTH
AVAILABLE



PHILCO

LANSDALE DIVISION, LANSDALE, PENNSYLVANIA



Allied Research scientists, engineers and technicians in the Geophysics Division, one work directly on the frontier of knowledge utilizing the latest scientific and engineering technological advancements to perform studies in... satellite meteorology, radar meteorology, short-wave weather forecasting, cloud and fog dispersion, and other areas as diverse as the weather itself.

Contributions to this and other fields of interest are greatly enhanced by completely equipped laboratory, testing and production facilities.

The uniquely broad capabilities of Allied Research have created outstanding career opportunities for those dedicated to working on the frontier of knowledge in...

SOLVING THE PUZZLES OF METEOROLOGY



To learn more about the career positions available to qualified scientists and engineers, and to receive a complete catalog, a booklet describing Allied Research facilities and capabilities is now available on request.



ALLIED RESEARCH ASSOCIATES, INC.

42 GREAT NORTH ROAD, CAMBRIDGE, MASSACHUSETTS 02139

A SUBSIDIARY OF RENTAL AIRCRAFT CORPORATION



East to West...Facilities you can depend upon

Keeping pace with dynamic developments in the use of cryogenic fluids, STANDARD-STEEL CORPORATION has the specialized plants and equipment that can be customized with your most demanding needs. Strategic facilities across the country.

These facilities use the latest in America, especially designed for one purpose—the producing of superior cryogenic products.

Making a variety of equipment for storing, transporting and distributing low temperature liquids, this partner organization can be of benefit to your program. With plants and facilities in Massachusetts, Illinois and California, STANDARD methods and management will satisfy your most exacting requirements. Contact our nearest plant:

STANDARD STEEL CORPORATION
CAMBRIDGE COMPANY Division



555 Brattle Avenue
Lexington 34, Massachusetts
California

Easton Free Works
Glenwood
Desert Shores, Illinois
Cambridge Company
(Division)
60 Anderson Park
Lexington, Massachusetts

FIREBEE:



AMERICA'S NO. 1 JET TARGET

The **Ryan Firebee** is America's most widely used jet target vehicle. It keeps man, missiles and weapons systems combat-ready than all other jet targets combined. The Firebee is fast (over 500 mph)...high-flying (up to 60,000 feet)...reliable (30 minutes-a-flight average)...durable (up to 20 flights).

The Firebee is operational, "off-the-shelf" hardware. It is the exclusive target used in the

Air Force's Project "William Tell" Weapons Meet. The Firebee is the most realistic stand-in for "enemy" aircraft ever developed to test men and weapons.

Now an even more advanced version of the Firebee is in production at Ryan. The Q-8C Firebee, already on order by the Air Force, has flown at Mach .86 speed and 50,000-foot altitude.

RYAN OFFERS CHALLENGING OPPORTUNITIES TO ENGINEERS

RYAN BUILDS BETTER

AIRCRAFT • POWER PLANTS • ELECTRONICS

Ryan Aeronautical Company, San Diego, Calif.

January 18, 1960

Aviation Week

and Space Technology

Vol. 72, No. 3
Aerojet ADP and ADC

HEADQUARTERS: New York 33-700 W. 44th St., Phone: Murray 5-2000, 500-12-2000, Madison 4-7-2-2000; New York, Penn., Atlantic 8-2-2000; Los Angeles, 33-7112, West 5th St., Phone: Hanley 3-2000; Tulsa 1-7-012, Commerce 3-1; Miami, 2-2177, Telephone: 2-2177; Memphis Office: 1-2000.

EDITOR-IN-CHIEF Robert W. Martin, Jr.
ASSISTANT EDITOR Robert W. Martin, Jr.

MANAGING EDITOR William Drayton

ASSISTANT EDITOR David A. Johnson

WASHINGTON Carl L. Johnson

NEW YORK Peter R. Kroes, William J. Edwards

SPRINGFIELD, MASS. William H. Johnson, Edward S. Johnson, William T. Keay

DETROIT David J. Nichols

ATLANTA John C. Nichols

CHICAGO Edward Johnson, Fred Johnson

DETROIT, MICHIGAN Edward C. Long, Leslie

MANCHESTER, ENGLAND Alan S. Goss

BERKELEY, CALIF. James T. Johnson

WICHITA, KAN. George T. Johnson

HOUSTON, TEXAS George T. Johnson

ST. LOUIS, MO. George T. Johnson

DETROIT, MICHIGAN George T. Johnson



Johns-Manville Announces... MIN-KLAD INTERLOK

...a new structural system interlocking Min-K insulation and high-temperature reinforced plastic

Min-K experience shows that in certain heat control insulation no one material will perform as well as two together—an insulation with protective high temperature *flexible* facing.

Problem is how to effectively combine these materials into a structurally strong system? The answer is Min-Klad Interlok.



12 Ounce Rolls, 33 Interlocking rolls, 12 Cuts, are one of several Min-K Insulations, and 91 heat facing.

—a new structural system that interlocks Min-K insulation and reinforced plastic, metal or other high-temperature facing.

The result, one product that gives the insulation every advantage of high-temperature plastic or metal reinforcement, toughness, rigidity! Erosion resistance! High heat capacity!

plus the outstanding advantages of Min-K insulation—an insulation that has the lowest thermal conductivity available for service temperatures up to 2800°F steady-state, and higher for transients. Min-K's thermal conductivity is actually lower than the molecular conductors of steel.

Wide range of facing

For the hot face, the insulator designer has

simply Min-Klad Interlok in a wide variety of heat-resistant and/or abrasion materials—rubber-phenolic, RAR-40, and similar reinforced plastics, as well as stainless steel and other heat-resistant materials and facing. For some requirements, the hot face can be made of a different material—for example, one that offers characteristics required for bonding or bonding to other surfaces and parts.

Take off! At AIA Annual insulation, Min-K insulation is being taken off to your specifications—any standard sheet panels, bent sheets, cylindrical liners or compound bottoms of any shape or size. Write today for technical specifications. Address: Johns-Manville, Box 44, New York 16, New York. In Canada, Port Credit, Ontario.

EDITORIAL

Mr. Hebert's Report

The long awaited report of the House Armed Services investigating Subcommittee headed by Rep. Edward Hebert (D-La.) has been issued today [see p. 26] and will be cogently read in detail by defense industry management and retired military officers now employed by defense contractors. We think they will find little in the report with which to take offense. The subcommittee's document what other people had long known, namely that the competitive weapons system advertising has to be approved by the service involved. Thus has been a long simple regulation to prevent abuse of the activity if the services choose to exercise it, and the contractor could hardly be held solely accountable.

It is inevitable that the relationship between retired military personnel and defense contractor should raise some problems of propriety and some defense firm managers have been far more than others in their handling of that problem. Mr. Hebert's investigation certainly produced no evidence that there is a generally unhealthy relationship in that regard or that defense contractors are let on the military "buddy system."

In fact, although handling with the last decade of defense advertising might make a case for the reverse there. This could mean considerable factual evidence to show that firms which had the fewest and lowest ranking retired military personnel as their payroll were gathering the largest share of defense contracts, while some firms who had a glittering general staff of retired brass as their payroll were consistently on the short end of defense contract competition and had only a drabbing backlog to show for their efforts. Any intelligent and efficient business management will have retired military personnel primarily on their technical and executive jobs for which certain areas of military experience offer excellent training.

Small Harvest

It is true that some business management will have to gain an acute taste to the Pentagon through a freshly minted officer of high rank, but the fruits of this policy are seldom healthy. The competitive aspects of private industry usually will force these men into their proper category without any long term requirement for special legislation. However, we think the legislation proposed by the Hebert subcommittee will serve its purpose in providing a uniform set of rules for such activity by retired military personnel.

Nobody can quarrel with the more realistic definition of "retiring" proposed by the subcommittee. The subcommittee's report is made quite clear in the following portion of its report:

"That, the subcommittee intends to be a compassionate, all inclusive, no escape definition of what the person he considers to be the selling game. No excuse or excuse of the kind of thing sold, whether tangible or intangible, in existence or to be produced. Beer and tobacco, phonon and vaporous systems get the same treatment. Persons and preprints are weighed on the same scale. There is to be no discrimination against government officials merely because of their service as such."

The subcommittee's original fear over certain types of defense contractors' advertising and the lobbying abilities of military and trade associations appears in the final report reduced to mild reproof and passing the buck to other agencies for action. The subcommittee apparently discussed what other people had long known, namely that the competitive weapons system advertising has to be approved by the service involved. Thus has been a long simple regulation to prevent abuse of the activity if the services choose to exercise it, and the contractor could hardly be held solely accountable.

Significant Facts

It is interesting to note that, while Mr. Hebert's subcommittee has been employed on a relatively minor aspect of the government-industry partnership in the defense business and the General Accounting Office has been concentrating on the alleged excess profits of that industry, two significant facts have appeared in other areas of the government:

First, the Securities and Exchange Commission reports that during the third quarter of 1959 the percentage of profit for the defense industry in relation to net worth has dropped below the national average for all industries for the first time [see p. 101]. The profit ratio on sales has been dropping sharply for the past few years, falling to 1.3% for the third quarter of 1959.

Second, Sen. Stuart Symington (D-Mo.), known before his defense appointment but now branching out as an agricultural probe, has developed testimony before his subcommittee that shows the government has been getting gains from defense profits as high as 150% for storing surplus government grain. It appears to be some what inaccurate for a government that probably approaches 100% profit for storing its surplus grain to depict the action as defense contraction rules to 1.3%.

It is necessary for Congress and the executive branch to watch closely the profit relationship of private industry and the government in its defense activities. Certainly, nobody will tolerate for long any excessive profit by industry in this area. But, on the other side of the coin, industry cannot continue to perform adequately the technical mission the government requires if it is surrounded and handicapped on all sides of activity that it cannot perform sufficiently. Funds to invest in research and development or to justify its defense work to its shareholders.

We think that, while Congress through Mr. Hebert's subcommittee and others should continue to vigorously exercise their watchdog function over public funds, they should also devote considerable effort to a fundamental and constructive extension of the government-industry areas with a view toward developing a more effective and equitable relationship than the recent policy tends will permit. Without a commensurate constructive effort along this line, thus watchdog efforts will add little to their avowed purpose of developing a more effective defense at a reasonable cost to the taxpayer.

—Robert Hebert

JOHNS-MANVILLE

All the best needs continue to provide a custom-made thermal energy control system.

SOLO

*now the world's best OBJECT ACQUISITION system

Despite the most intense determination, Alvin's ability to reach out and grab an object takes a back seat to SOLO. Once SOLO's electro-optical mind is made up, nothing can surmount it, deter it. SOLO controlled devices . . . passive, jumpproof, accurate, available—literally the world's best object acquisition system.

RIGHT FOR FLIGHT

WEARABLE SYSTEMS
AERIAL & FREIGHT HOLDING DEVICES
DEBURST INSTRUMENTATION
AFFILIATE DATA DISPLAYS
MOBILE AIRPORT & AIRLINE SYSTEMS



CHICAGO AERIAL INDUSTRIES

1010 HAWTHORNE, MELROSE PARK, ILLINOIS 60160 • DAYTON, OHIO • LOS ANGELES, WASHINGTON, D.C.
OTHER OFFICES: KIRKWOOD, D-HEADS, AERIAL SURVEY, Franklin Park, Illinois; PROJECT OFFICE, CORP., Indianapolis, Ind.

WHO'S WHERE

In the Front Office

Dr. T. F. Wilkeson, a director, General Instrument Laboratories Inc., Buffalo, N.Y. Dr. Wilkeson is in the Lawrence J. Kunkle office staff of Rockwell Industries, Inc.

Dr. J. Robert Derosier, president, Space Recovery Systems, Inc., 23 Segundo, Calif., succeeded Eugene J. Sterkoff, who can remain a director.

W. F. Sauer, president, Aircraft Fuel Corp., Roseland, N.J., a subsidiary of General Aircraft Co., succeeded William F. Conroy, Jr., retired.

Philip W. Smith, president and a director, Jack & Jill Inc., the Cleveland Union, announced Frank J. Kuhnsen, deceased.

Robert D. Gibson, president and a director, Electro, Inc., Kingston, N.Y.

Keneth G. Paine, vice president-manufacturing, Douglas Aircraft Co. Inc., became president, announced President W. Elmer, retired.

Logan C. Taylor, vice president-corporate and general manager, American Airlines, Inc.

G. H. Olsen, executive vice president, Air Reduction Sales Co., a division of Air Reduction Co. Inc., New York, N.Y.

Sam E. Johnson, vice president-marketing, Beginning & Research Co., El Monte, Calif.

Lincoln Van Cleave, vice president-production, Wyle Laboratories Corp., El Segundo, Calif.

Mr. B. Beck, member and responsible manager, Space Research Corp., Malibu, Calif., a subsidiary of Unisys Corp.

Col. Thomas W. Cook, chief of staff Army Ordnance Vehicle Command, Huntsville, Ala.

Lt. Col. Martin N. Abremson, chief Womble, D. G., Regional Office of the Air Research and Development Command.

Honors and Elections

Sir George Edwards, managing director of Vickers-Armstrongs (Aircraft) Ltd., has been named 1964 president of the British Government's Royal Society for the promotion of the development of science and encouraged scientific endeavour in the interested sciences during the world's most numerous service at the fast turbine-powered jet-powered aircraft.

Major H. Canada has been appointed to the senior staff of the Institute for Defense Analysis, Washington, D.C. Mr. Canada is in a new top level of status as manager of Advanced Engineering Projects for General Dynamics' Advanced Electronics Center.

Donald H. Douglas, Jr., president of Douglas Aircraft Co., has been elected honorary chairman for 1964 of the Export Committee of Aerospace Industries. Sam Alex T. Bogart, vice president of North American Aviation, was elected chairman, and Robert W. Douglas of United Aircraft Export Corp., vice chairman.

[Continued on page 148]

INDUSTRY OBSERVER

► First flight test of the Army-McDonnell F-101C (70-719) will be expected before May 1 from the recently-completed Fasilong complex at Air Force Missile Test Center's Cape Canaveral, Fla., launching area. Fasilong is assembled and put through an extensive checkout at Martin's Orlando, Fla., facility, but all static firing of the two Thielert engines are conducted at the Army Ballistic Missile Agency in Huntsville, Ala. Stages can be reloaded and static fired more than once.

► Soviet solid-propellant research project, which National Aerospace and Space Administration had expected to fire before the end of last year (AW, Oct. 19, p. 23), now is not expected to be flight tested before spring. Primary reason for the delay is that NASA underestimated the length of time required for the in-house part of Soviet development work being done at its Longley Research Center. As late as early last October, NASA had hoped to make the first launch from Wallops Island, Va., before Dec. 31.

► An F-105C/T-38A Alpha Jet F-105C aircraft fired over 6,300 lb. of smoke from its Canaveral tail pod about 10 sec. of solid fuel remaining at the termination of its flight. Remaining fuel represented an additional equivalent range of approximately 2,000 m.

► Mitre Corp., of Boston, will serve at least to a winter trade group being formed by the Air Research and Development Command to study overall Air Force requirements for electronic data processing systems for the 1965-75 period and the possibility of combining portions of support systems that are now under development (AW, Dec. 26, p. 15).

► Air Force weapons board and Air Combat AFCEC are to give a complete report on progress and status of the Minuteman solid-propellant ICBM weapons system development within the next four months. Presentation will be made to Air Force's ballistic missile complex at Cape Canaveral, Fla.

► French are making a major bid to persuade the Australian government to authorize the purchase of the Mirage 5A interceptor rather than Lockheed's F-104, which the Royal Australian Air Force apparently favors. France, with an almost billion of trade with Australia and in search of orders, is offering low prices and a number of modifications, including fitting the RAAF Mirage with an American-built engine. However, political considerations alone probably will give a substantial edge to the F-104 in any actual purchase. Australia has repeated often "we British" side from the English aircraft industry in the past on grounds that, in the event of war in the Pacific, it would be dependent upon English support rather than maintaining the major portion of its fighting in cooperation with the U.S.

► Lockheed Martin and Space Dynamics are completing installation of a large-scale high altitude wind tunnel at its Palmdale, Calif., research facility capable of sustained velocities in excess of Mach 20 and up to 4,000 ft/sec. Generator with the capacity of producing two million watts continuously or five million watts for two minutes can sustain velocity and temperature conditions for hours.

► Launch Complex 16 at the Air Force Missile Test Center, damaged Dec. 12 by the explosion of an Air Force Institute Titan ICBM test vehicle (AW, Dec. 21, p. 19; Jan. 11, p. 68), was put back into service on Jan. 11. Repair originally was expected to require approximately two months. Titan C-4 was erected when the pad was ready for use and probably will be ready after the flight of the B-70, expected sometime this week.

► Soviet Union and Czechoslovakia have agreed a new technical cooperation agreement during 749 branches of a joint cooperation commission through which exchanges of scientific and technical specifications as to be made during 1965-6 50% increase over the 1959 program. During the year 1965 Soviet Czech institutes also are scheduled to continue coordinated work in a number of major scientific problems.

complete systems
capability for
actuating a specified
load in response
to an electrical signal

MOOG:
from

If you need an electrohydraulic servoactuator system, look to Moog for complete system design and production capability. Moog can supply an integrated package actuator system to meet your performance requirements, including amplifiers, servovalves, actuators, and necessary hydraulic and electrical power supplies. This integrated package approach can achieve an economy of space, weight and production cost not possible with conventional "component-oriented" systems.

WRITE OR CONTACT MOOG FOR DETAILS

MOOG SERVOCONTROLS, INC. PRIMER AIRPORT, EAST AURORA, N.Y.

LEADING INNOVATOR AND PRODUCER OF ADVANCED ELECTROHYDRAULIC SERVOVALVES

Washington Roundup

B-70 Rescue Operations

An Air Force and congressional advocate of mounting at least a portion of USAF's operational plan for the North American Aviation Model 3 B-70 bomber from Administration imposed cuts are willing to compromise for a small squadron of B-17s equipped specifically to oppose a original USAF plan for 80 planes, and the Budget Bureau's order that only two prototypes without major subsystems be built (AW Dec. 7, p. 29).

Capital Hill sources on the need for the B-70 probably will be touched off during a special appearance of Air Force Chief of Staff Gen. Thomas D. White in support of USAF's fiscal 1961 budget. Asked at a National Press Club luncheon last week if the Director of Defense represented an Air Force or a Budget Bureau decision, Gen. White replied: "I can answer that simply. It would be a Air Force decision." He said that "I wouldn't be here if I had been unable to support the decision, but I was added."

As a possible counterpoint, Lunsford, who can certainly be well worth listening and according to his congressional sources, "is a man of his word."

President Eisenhower was asked to comment on Gen. White's remarks at his press conference last week. • L. Edie Price, Washington Star: "From what our Air Chief Gen. White said at the Penn Club luncheon, he believes that the virtual cancellation of the B-70 program was a budgetary decision originally out of Air Force direction and he indicated that he might take it up on Capitol Hill."

• The President: "I will see that. It is certainly not a budgetary decision because there is money in the budget and, as I pointed out, there is no way that I hope we could give up some of our defense programs."

"The President's position is to the maximum for putting weapons at a particular time. The B-70, as an operational weapon, is going to take a long time to produce, and we certainly ought to be in a pretty strong position in many other ways before those years elapse."

World Congress Canceled

Air Force *News* is continuing plans to hold an annual World Congress of Flight in October this year in Washington, a mission that was to have been highlighted by a Convair 990 around the world flight with stops in leading capitals of the world community. "World Congress" participants were to have been staged by leading U.S. military and industry officials. Main reason for the cancellation, which puts a crimp into USAF plans to hold the congress on alternate years with the Penn Club there, lack of definite confirmation that an 1959 world tour would be available. Confirmation leaves the date of the World Congress in doubt, but an USAF spokesman said last week that the first date has sprung in Las Vegas "so a racism, and we'd like to hold the show on that date."

Army Diverted

Army apparently has been diverted from its mission to the Defense Department to assume management responsibility over all helicopter production and development for the three military services. Army spokesman said, "as the major user of helicopters, and with the requirements of such systems, it is in the Army's interest that this field be centrally managed when ever an Air Force liaison B-41B flight by two USAF planes recently established a world's altitude record for the class of 50,100 ft. broad-

ring a previous mark held by the Soviet Mi-1 (AW Mar. 19, p. 40).

Atlas Scorecard

Of the 14 Air Force-Carrier Atlas ICBMs which President Eisenhower had requested within an average of two miles of their target at ranges over 1,000 mi. (AW Jan. 11, p. 28), seven hit within a two mile radius of the target. One Atlas hit exactly two miles from its target, and the remaining six missiles impacted more than two miles away from the target. All of the 14 Atlases described in the President's *State of the Union* message were equipped with radio command guidance, a system that is more accurate than the inertial guidance system that will be used in later versions.

Another Blast at STL

Congressional sources expect General Accounting Office in fall to add to the private enterprise status of Space Technology Laboratories technical manager of Air Force ballistic missile programs, in a comprehensive report on USAF missile management which will be submitted to Congress shortly (AW Jan. 4, p. 17). This too also the recommendation of the House government and public works committee, which is under the direction of Rep. John T. McNamee, D-N.J. The subcommittee, headed by Rep. Clark H. Hefield (D-Calif.), recommended that STL be continued as technical manager "until it can be converted into a nonprofit institution." (AW Sept. 14, p. 146). USAF has replied to the Hefield report that a special committee headed by Clark B. Vliet, director of aerodynamics at California Institute of Technology, is evaluating the recommendation.

Republican Speech Circuit

Republican National Committee has recruited T. Keith Chappell, National Armaments and Space administrator and E. R. Shadwick, Federal Aviation Agency administrator as speakers for its series of road shows. "Travel With the President" for Jan. 27, Chappell will speak in Jackson, Mich., and Duluth in Superior, Mich. Other "big" speakers will include Defense Secretary Thomas S. Gates, Jr., in Portland, Ore.; Army Secretary, William M. Bunker in Charlotte, N.C.; Navy Secretary, Forrest E. Tammie in Richmond, Va.; Assistant Defense Secretary Marion S. Smith in Atlanta, Ga., and Assistant Army Secretary, Davis Sheet in San Antonio, Tex.

Cutter's Return

Robert Cutler, who resigned two years ago as the President's special assistant for national security affairs for "health personal reasons," is returning to Washington as executive director of the Organization of American States. Inter-American Development Bank now is in its formative stages. Cutler, charged in his critics with often withholding vital information on Soviet progress from the President during his White House tenure, was one of three U.S. officials appointed to the bank. In the President's new cabinet, Cutler will be a Director of Defense. Other appointments were Vice President Hubert H. Humphrey, and Under Secretary of State Douglas Dillon, chairman of the commission. Cutler, after leaving Washington in June 1955, returned to Boston to resume his chairmanship of the GM Cafeteria. That Co. —Washington Staff

Hebert Urges Stiffer Influence Barriers

New legislation, proposals are designed to tighten military contractor conflict-of-interest regulations.

By Katherine Johnson

Washington—House Armed Services Investigating Subcommittee, in a report being released today, is proposing legislation, administrative regulations and self-policing actions designed to erect a barrier against possible influence by former officials and Defense Department officials in obtaining business for military contractors. New conflict-of-interest legislation supported by the subcommittee will be introduced in the House today.

"Selling" by former officials to their services has been banned by a串 of laws and regulations dating back to 1956. "Selling" traditionally has been understood as an across-the-table type of sales transaction for hard cash. The subcommittee headed by Rep. Edward Hebert (D-La.) would broaden it to include the "possession" of a technical or weapons system contract—as well as hardware.

Early Action in Congress

Washington—Developments during the opening days of the new congressional session last week should be previewed for the issues likely to impact defense contractors. The following bills have been introduced:

■ **Joint Chiefs of Staff** would be prohibited from using personal assets to profit from Government contracts. Sponsored by Rep. John G. D'Amato (R-N.Y.) and Rep. John C. Conyers (D-Mich.), the bill would prohibit officials from transporting for other uses, by early July 1, any equipment purchased or supplied to the military and ported away.

The bill would also prohibit officials from profiting for private use of military aircraft or equipment. This would apply to all and to the Post Office Dept. senior postmaster as well as military postmen.

■ Congress again would try to expand the 1975 transportation ban on passengers roamed during World War II. Last session, Congress reduced the ban to 350 days beginning July 1. Strong support for repeal of the limitation of 500 was expressed by Rep. Lee Metcalf (D-Mont.) and Rep. John A. Blawie, Jr. (D-Pa.).

■ Under a bill introduced by Rep. Morgan N. Meekell (D-Md.), the chairman of the Joint Chiefs of Staff would be prohibited to exercise command authority over the Air Force, Army, Navy and Marine Corps. He would have full authority to make all decisions on issues connected to the Joint Chiefs of Staff and would be principal military adviser to the President, National Security Council and the Defense Department.

■ Sen. Craig L. Zablocki (D-Wis.) questioned the wisdom of the Administration's decision to not seek the Air Force B-52B reprogram budget progress. Sen. Eagleton and the B-70 decision "may have the proper consequences to our national security," and urged that it be amended. He added that until the U.S. has an independent strategic strike force, a small enough force to support all of its defense forces.

■ An lobbying subcommittee has been established for the House Committee on Science and Astronautics by its chairman, Rep. Ovett Brooks (D-La.). Hearings on the service's studies and military space and missile programs begin Wednesday and can start July 6 through May 1. The hearings will begin by investigating the significance and importance of space programs, followed by subcommittee hearings on the National Aerospace and Space Administration's Fiscal 1969 budget requests, military space and missile programs and the administration's fiscal and budgetary plans on how to improve the space programs.

■ Hearings on the space programs and defense posture scheduled by the Senate Committee on Armed Services and Space Sciences and the Senate Foreign Relations Subcommittee, scheduled to begin July 27, are now expected to be delayed a few days due to conflicting schedules of committee members.

■ Legislation to provide greater competitive distribution throughout private industry of weapons business flowing from defense preparations and to improve opportunities for small business interests to participate in subcontractors in government procurement was introduced last week by Rep. Harry B. McDowell, Jr. (D-Del.). Under the bill, any weapons or other systems composed of two or more major items would be procured separately to obtain the maximum practicable competition for the most of contracts.

Rep. Bill introduced legislation today—subsequently supported by the subcommittee and Rep. Carl Vinson (D-Ga.), chairman of the full Armed Services Committee—that would tighten the conflict-of-interest laws now on the books, which differ from service to service and have been applied only to officials over the past 10 years.

The Hebert bill prohibits former senior officials of civilian Defense Department offices from "selling" to the department of the military establishment used for two years after separation from government service.

The subcommittee said it believed the definition of "selling" will be "a comprehensive, all-inclusive, 'no-scope' definition of what the public considers to be the 'selling game.' " This is the subcommittee's definition.

"All actions which bring a contractor and the government into contact with officials of the Defense Department for the purpose of obtaining contracts from that department for the procurement of supplies or entanglements in existence at the time or to be performed in the future."

Present Status

Present statutes generally only is "selling" by former procurement officials still in active service. The subcommittee said, however, "We are not possessed that procurement officials are the only ones who can engage in selling. In many areas, the field of technical procurement of legal work and directly concerned with procurement of, but with the nature of, weapons to meet military requirements."

The subcommittee conceded the bill finally is determining "when selling commences," but not.

"A proposal to create hardware is at much a part of the role of that hardware as is the product itself. One can not exist without the other. The production and display of a plan which will produce hardware is not selling, but it is a part of the selling process."

"These three—proposal, development, and production—form a chain. Each is a part of a sale. The mere fact that the project can be delayed during development or production does not make the transaction something other than a sale. A chain begins when the first link is forged."

A distinction between "presenting a plan for an advanced weapon system" and selling hardware, the subcommittee declared, is "a distinction without a difference."

The Hebert subcommittee's investigation of changes of "responsible bids"

subcontractor as defense procurement was launched last summer to study of defense legislation which briefly passed House passage. The legislation, sponsored by Rep. Alfred E. Santangelo (D-N.Y.), passed without a hearing that employed former high ranking members of Congress for five years after the end of their service careers. It first passed the House 131 to 130 but was inconclusive, deleted 125-147 an amendment that the Hebert group would make references within a thorough study (H.R. 11, p. 15). The subcommittee's report has been distributed to every member of the House.

Likewise, the Hebert legislation will begin shortly after before the full Armed Services Committee on June 20, a subcommittee on personnel headed by Rep. Paul Kuhler (D-Tex.).

The subcommittee's bill referred attempts to establish a code of ethics and policy standards—at the legal, medical and other professions have done. The Secretary of Defense was requested to immediately convene a group that would take the lead in developing a code.

The subcommittee also made these recommendations for administration review by Defense Department:

■ Establish a committee of former officials, including ex-defense contractors or subcontractors. In this manner, the subcommittee said, their relevant liaison in other activities could be maintained "before the fact and not after the fact" and there would be less confusion. A "directive of confidence" could promptly rule on doubtful cases of conflict-of-interest.

■ Establish rules on the entertainment of active officials by defense contractors. The subcommittee noted that entertainments of such of the services invited to their disposal of entertainment must be approved by the Marine Corps at the Pentagon and the Air Force at the Pentagon. The chairman and the subcommittee will be required to find out what action has been taken to more stringent stringent standards. The report of the Marine Corps that "the committee can not in any way doubt that he had 'business in mind' when it entertained defense officials in the Pentagon, because 'it tried to get a man in a deduction at a 'business expense.' " But the Internal Revenue Service denied that deduction.

■ Set guidelines under which contractors can advertise weapons being produced by the Department of Defense. The subcommittee was critical of federal type advertising that "presented commercial products as military products and introduced names, service and government publications into much military discourse." The House advertising of Boeing Airplane Co. and the Macmillan advertising of Western

Electric Co. on the eve of a decision by Defense Department on a "firm" of firms for an defense contract was cited. The subcommittee labeled "dangerous and unhealthy" contractor advertising pertaining to them, the military effecting a weapon or the contractor in part of a competition upon employees in subcontractors.

The subcommittee also outlined obvious misconceptions in legislation last summer's hearings. It cited that, for example, some actual officials and others had claimed that a selected official is a "house-husband" with no influence and that his marital status, as a fact, "a handicap." Other subsections indicated that the defense agent experts would the loss of "selected officials."

The subcommittee said "there can one situation a 'house-husband' with one 'selected' consequence" in the cost, complex and developing field of military requirements of the "house-husband" as in fact, that off hours raises significant difficulties.

"Three third offices are either 'house-husband' or 'spouse.' That cannot be both. The 'house-husband' would drift off old concepts, but the 'spouse' wife would be married. There is only one

President: No Partnership in Defense

Washington—President Eisenhower's views on the portion aspects of defense policy were reported last week in the exchange during his press conference. ■ **State** McClellan, Milwaukee (N. H.) Union Leader. "See, there seems to be a sense of attitude of letting off defense adequacy, the subject even in your State of the Union message, and your Republican leaders, as they come out of the White House, they seemed to think any question of adequacy here is embarrassing."

"Now, Sir, isn't this more of a union situation? The Pelosi subcommittee you referred to in your State of the Union message, you and we would have used existing legislation into the same terms this year."

"Do you mean 'we' mean me or you?"

■ **The President** "With you a minute. Are you asking a question or making a speech?"

■ **Sen. McClellan** "I am asking two questions, sir."

■ **The President** "Okay."

■ **Sen. McClellan** "Two questions, sir, with an introduction."

"Sir, it is not even status, the question of adequacy or defense more status than just to let it sit as a person's name; and we will be the subcommittee, the senior subcommittee, with the article that we get you, we may be more than one."

■ **The President** "I am not exactly certain as to the best rank one of these men off the way."

"I know, and I think the budget there, how many have been authorized each year, and they know that the testing of the Polk article is going ahead, and let me tell you, the very last one that they have had has been successful."

"Now, Iardon, I don't think it very kindly that the implied suggestion that I am dealing with the white master of defense on a personal basis. First of all, I don't think it is personal, and I want to tell you this. 'We spent our life in the service, and I don't think that there should anybody I think, that is in the military, because I have given my life to it and on a basis of doing what is good for the government and for the country.'

"I believe that the nature of defense has been handled well and efficiently in the proposals that have been—will be taking the Congress within a matter of a day or so, and I think those people that are trying to make defense a partnership are doing a disservice to the United States."

Electric Co. on the eve of a decision by Defense Department on a "firm" of firms for an defense contract was cited. The subcommittee labeled "dangerous and unhealthy" contractor advertising pertaining to them, the military effecting a weapon or the contractor in part of a competition upon employees in subcontractors.

The subcommittee also outlined obvious misconceptions in legislation last summer's hearings. It cited that, for example, some actual officials and others had claimed that a selected official is a "house-husband" with no influence and that his marital status, as a fact, "a handicap." Other subsections indicated that the defense agent experts would the loss of "selected officials."

The subcommittee said "there can one situation a 'house-husband' with one 'selected' consequence" in the cost, complex and developing field of military requirements of the "house-husband" as in fact, that off hours raises significant difficulties.

"Three third offices are either 'house-husband' or 'spouse.' That cannot be both. The 'house-husband' would drift off old concepts, but the 'spouse' wife would be married. There is only one

Mergers Regroup Britain's Air Industry

By John Tompfl

London-Merger of the aircraft and engine divisions of Vickers, Ltd., English Electric Co., and British Aircraft Co. and the formation of a new group by Westland aircraft manufacturers regrouping of the British aircraft industry into two aerospace groups, two engine groups and a helicopter group (AW Dec. 10, p. 21).

The proposals should have been agreed in principle.

This gigantic consolidation operation which leaves only British and Fiat Italia, Fiat, Farnborough Page independent, begins with British's take over of English Aircraft and its bid for Blackburn and General Aircraft. The Hawker Group's assets thus clustered in Denmark will be sold for the de Havilland group.

Holdings Company

Fusion of the second large group, perhaps a more difficult measure because of the financial structure of both Vickers and English Electric. Solutions have been the formation of a joint holding company with Vickers and English

Electrical holding a 40% share holding and British 30%.

The holding company will control parts and much of the original aircraft companies will become wholly owned subsidiaries. Besides this development the new group has already begun negotiations with a view to taking over Hunting Aircraft Ltd., a member of the Hunting Group. Previously Vickers Armstrongs (Aircraft) Ltd., was a wholly owned subsidiary of Vickers, Ltd., and a holding company for 51 companies, employing 65,000 people.

The new helicopter group which will control all British's helicopter activities outside the Farnborough Page independent, begins with British's take over of English Aircraft and its bid for Blackburn and General Aircraft. The Hawker Group's assets thus clustered in Denmark will be sold for the de Havilland group.

The government has a 50% share holding in Short Bros. & Sons Ltd. Of other aircraft manufacturers Farnborough Page has given no indication of its intentions and speculation that negotiations are proceeding with Westland is mounting.

The Hawker-de Havilland merger in December proposed British business offices since its speculation on possible new groups in Britain's consolidated aircraft industry it was concluded the issue likely. It was emerged, according to reliable sources that British not only an English Electric offshoot.

Sands' Demand

Before the announcement, de Havilland had been considering a likely solution for the use of three new aircraft groups. The Hawker-de Havilland merger that had followed British's bid suggests to believe that the industry had at last yielded to one of Minister of Aviation Dennis Sands' primary demands for formation of two, not three, aerospace groups and two engine companies.

The emergence of these two groups is not to be taken therefore not just the survival of all other aircraft and aircraft equipment but also the reorganization and reorganization manufacturing. As now contemplated, these two groups are not only fully able to handle all procurement contracts in the missile and aircraft field but might well argue their capacity to make their own equipment internally subcontracted.

Revelation of the Hawker-de Havilland merger came hours after a meeting between Dennis Sands and the Secretary of British Aircraft Constructors—a meeting which appears to have been a finalization of the industry's future.

Previously, manufacturers had refused to meet Sands' request to resign and the government had specifically aimed both the scale of its military requirements and the nature of any financial support for the civil aviation industry (AW Oct. 26, p. 36). But Sands is reported to have refused to dissolve government aircraft policy until the

airlines had reorganized. It looks as if both agreed in time at that meeting and now all is over but the shooting.

A top de Havilland spokesman told Aviation Week that if mergers were inevitable, the company has made the most sensible decisions both in the case of its own survival and in the industry's future. According to the de Havilland spokesman, at the least less overlapping there should be the case with other parts and the company would be in the status of financial independence.

Possible Conflict

In addition, the only possible conflict de Havilland foresaw is that between the company's DC-3 replacement powered by two General Electric T56 shaft (under license) and the Hawker Siddeley Avro 748 (under license).

A definite change of the de Havilland aircraft program had taken place, Avro 748 was to be the company's first aircraft to be built under contract a worldwide market name. And even with that aircraft de Havilland does not see the two specifications clashing head on.

Against that situation, de Havilland now class that all British high-performance and aircraft experience and know-how lies in the all-important medium range field lies with it. Hawker Siddeley has more.

In the engine field, the Gnome and the supercharged Gnome variants will fit into the British Siddeley engine family. These aircraft will shortly return to de Havilland's aircraft design center. The new and growing aircraft control and electronic division of both companies are expected to continue with not overlapping.

Implementation of the merger has still to be worked out. It is believed that Hawker Siddeley will want to distribute some DB-120 (barrel) transport, fabrication and development around the group.

The merger appears to leave little future for the Avro Avro 748 (under license) and de Havilland's Folland and Fairey Avro 748.

Soon after the announcement of the merger report began circulating that the minister was not altogether happy about the position in the new merger and considered the cancellation top heavy.

Sands was consulted to have in mind the group of fairly even structure with Vickers-English Electric-de Havilland as one and British Siddeley as the other.

This arrangement would also have intended Bristol being swallowed by the two groups and each group being situated in opposite ends of the country. The Siddeley group might have been forced to some parties the best man to strengthen Britain's missile effort for

British Minister Favors Mach 2 Transport

London-East positive indication that the British government will back the manufacture of civil aircraft was given by Ernest Sefton, minister of aviation, here last week to the Royal Aeronautical Society.

The air minister also was outspoken in favor of civil aircraft on land and concluded that civil aircraft would bring "between Mach 2.5" by the 1970s. A definition of the minister's attitude to the development of a supersonic or sub-sonic aircraft around STOL aircraft has been one of the many issues in the current reorganizing operation. This expression of confidence in the producer of such a venture immediately paves to a government policy statement, it of purchase intent to the north British Vickers Group which replaces all British's aerospace interests. The cost of a reorganization program, hardly identified, would be very heavy indeed, but that, he thought, would be largely offset by the increased frequency of operations.

Sands' speech rapidly switched on the need for development of civil aircraft models of civil aircraft on land and for the introduction of automatic flight landing techniques. This was used for a single effort to both these fields. Sands maintained and his references to these matters may reflect the minister's intention to buy both. The British Midland holding company already has been granted the de Havilland DHC-120 jet transport, and the Fairey Kestrel VTOL.

Sands' bid brought new speculation in the industry, and in the British press

announcing which aircraft now being built will receive government backing. One

aircraft which has been mentioned is the Vickers Viscount and the VC-11, a medium range aircraft.

Another aircraft the DHC-121 being developed at the expense of the VC-11 for testing is also

in doubt that government support for both aircraft is unlikely.

in the next strength of the combination in the civil field. The Avro, the Avro 748, the Comet and the DHC-121 will be aircraft with sales potential in the short to medium aircraft stage. It has been the two companies no doubt feel that U.S. competition is likely to be much heavier than that facing Vickers in the longer range aircraft range.

Multinational Industry

On the other hand, according to other observers, there seems to be a wish to concentrate the profile such that the two aircraft which are original to Britain to the European aircraft field. The integration of the aircraft division of Vickers-English Electric, English Electric and British aircraft would leave the whole of Britain's limited aerospace resources and, in case of the acquisition of aircraft built up in the U.S., Britain does not seem able to afford splitting its aerospace design capacity between the groups.

It is considered in some ways to be fairly debatable whether the shorter commercial program of a British super aircraft rather than a more organization of the various as the comet, Gnat, BAC-111 it is agreed that it is not possible with an aircraft of this size to be one for one aircraft and the other for a supersonic aircraft project and hope that this would give the best explanation of Britain's role in the world's subsonic civil aircraft market.

Undoubtedly one of the main factors behind the Hawker-de Havilland merger

The fact that both groups will now have space ship space and development personnel as also expected to lead to major reorganization among the aerospace manufacturers.

The aircraft industry has long complained about the inadequate development funding of the aerospace manufacturers and was to find new market in its equipment.

Both Vickers and Westland have said that the merger involving both companies must be full government approval and qualify for government grant.

British Aviation Industry Regrouping

Old Major Aircraft Companies

de Havilland	Avro
Vickers-Armstrongs	
English Electric	
Bristol Aircraft	
Short Bros. & Harland	
Hawker Aircraft	
Hunting Aircraft	
Short Bros. & Harland	
Fairey Aviation	
Hawker Page	
Avro (de Havilland-Hawker-Polymer)	

Hawker Company

Westland-Southern Rock (Bristol under negotiation)

Engine Companies

Rolls-Royce
Bristol Siddeley
Napier-Rolls

de Havilland Engine Division

New Aircraft/Motor Company

09 Vickers-English Electric-Bristol

09 Hawker-de Havilland (Bristol & General under negotiation)

Helicopter Company

01 Westland-Southern Rock (Bristol under negotiation)

Engines Company

01 Rolls-Royce

03 Bristol Siddeley-Ad. Heinkel

Industrials

Short Bros. & Harland
Fairey Aviation
Hawker Page
Avro
Napier Engines

Brooks Proposes NASA Patent Changes

By Fred Eustace

Washington—Legislation threatening National Aeronautics and Space Administration patent rights and government ownership of certain rights in inventions made while working on government space contracts was introduced in Congress last week by Rep. Dennis Brooks (D-La.), House Space Committee chairman.

Brooks' bill, which generated an alternative patent review bill, NASA is sending to Congress, would amend Section 301 of the National Aeronautics and Space Act of 1958, which was written for the government to title title to all inventions in a disclosure made in connection with space work unless government rights are waived under certain conditions.

Strong Attack

This section of the Space Act has been under strong attack from patent attorneys, industry representatives and other groups over it was enacted. It was argued that the provision placed the government in a position with potentially enormous liability if a patent holder claimed that his invention had, at best, invented a variation and that it resulted in industry thriving away from accepting NASA contracts.

Provisions in the Brooks amendment are the same as those recommended by NASA during hearings before the Patent Subcommittee in December (AW Dec. 14, p. 37), and supported by patent attorneys, individual attorneys and industry contractors.

Specifically, the amendment would

repeal the entire patent section and substitute the more liberal set of rules.

• NASA would provide compensation in a contract to govern disposition of patent rights as a reward deserved to protect the public interest and the reputation of the contractor. Under current provisions, NASA has no alternative but to analyze in its contracts a section stating that the title to inventions made in the performance of the contract becomes the exclusive property of the government.

• Whenever a contractor does provide for the transfer of title, it is up to the U.S. NASA would then have as those were all or part of the rights as such time and conditions as the contractor determines to be in the best interest of NASA. If a award should be granted, however, the U.S. would be given a royalty-free license for the protection of such an invention throughout the world. U.S. rights to the title can be waived under the present law, but only after a hearing and recommendation by the Inventor and Contracting Board.

• Contractors simply would could be succeeded in dealing with the new provisions, providing final payment has not yet been made.

During the hearings last fall, most industry representatives told the subcommittee that there have been many instances in which contractors have refused to accept NASA contracts because of the patent provision. They said most of the companies that serve government research and development contracts do so for only one reason—the certainty that a product may result that

The other day, Lent said, was Statute Instruments, Los Angeles, Calif., where he was formerly employed. The company president, Louis Strutin had invented an enhanced static gas turbine, a testing element for missiles and already used in testing. Strutin has cited many times, Lent told the subcommittee, that he would never stop a government research and development contractor because of doing it is obliged to give away the fruits of his own research and development.

GE Experience

One of the largest manufacturers to have done a NASA contract out patent provisions was General Electric Co., the subcommittee was informed by letter George E. Hall, GEC vice president, and the company for about 10 years had conducted and licensed inventors of the feasibility of using supercooled materials in products, a program which should have significant public advantage than conventional syntheses. In the course of research and development

work, several inventions were disclosed. Last year, the Army awarded GE a contract to power communications research aircraft toward the ultimate development of such a program, Hall said, but as the contract progressed, those items were excluded from the license grant of the patent rights under.

Later, when negotiations were started to supplement the initial contract, GEC was notified that NASA was to finance about half of the further work and that the new agreement would include all major design contracts, Hall will provide such liability missile and space programs contractor with means of source component for which licensed by every other contractor. Royalties will be provided in terms of royalties charged on products such as may be used.

As a result of subsequent negotiations, Hall said, "a contract with a non-NASA agency has been renewed which contains non-expansive patent provisions"

Space Law Overhaul Submitted

Washington—Space law changes to clarify the National Aeronautics and Space Administration's responsibility for operating a separate civilian space program and to shift space planning decisions from the White House to NASA were proposed to Congress last week by President Eisenhower.

Under Eisenhower's proposal, the National Aeronautics and Space Council and the Civilian-Military Lawmen Committee would be abolished, and the space law would be rewritten to make clear that NASA is to run a clearly civilian space program. The proposal was strongly urged several months ago by a Senate committee to review space law and legislation.

At the same time, the President officially ended Congress that he will transfer the Development Operations Division of Army Ballistic Missile Agency to NASA, a move that becomes effective in 60 days unless Congress objects.

Soviets to Cut Back Conventional Arms

Moscow—Soviet Union has the greatest nuclear rocket striking force in the world and will cut its nuclear forces proposed in its third Soviet Foreign Policy and Defense Conference.

Vladimir Kholodenko told the fall 1960 meeting of the Supreme Soviet last week that a "second phase" will be an agreement and a reduction of conventional arms. Eisenhower said, and they will continue to be produced and the West agrees on a limit. Production of some missiles has been discontinued because they are taking the place of surface, he said. Armed forces will be reduced from 1,670,000 men to 1,200,000 men. The cuts are being made because of Russia's "weight and strength" and not because of economic weakness, the president said.

As a final practice, a single conventional program does not exist and is in fact unaffordable and the situation

Data Exchange Program

Washington—Contractor reliability data exchange program affecting about 50 major aircraft contractors participating in Air Force, Navy and Army missile and space programs has been approved and negotiations will go on to establish a work plan. The work plan alternative is expected to include all major design contracts, Hall will provide such liability missile and space programs contractor with means of source component for which licensed by every other contractor. Royalties will be provided in terms of royalties charged on products such as may be used.

concept of such a program has caused considerable. The addition, utilization of space, and the research and development effort directed toward that end, are the principal parts of the total defense program of the United States.

News Digest

General Electric Co. has formed a new defense materials engineering organization, The Hayes Organization, to participate in the NATO countries in targeting their engineering, manufacturing, testing and management capabilities. New president, Appointed Managing Director Electronics N.Y. is headed by Miss Geneva S. Hassell, USAF (ret).

United States proposal for a meeting of the United Nations Committee on Peaceful Uses of Outer Space in Feb. 1961 rather than March 14 April was voted on word from the Soviet delegation before failure to face an earlier date.

White House last week sent the memorandum of Civil Aeronautics Board Chairman James R. Durkin as associate pastor of the U.S. Court of Claims to the Senate for confirmation.

As Faure Research Division was still active, although last week by Air Research and Development Command. Third of last planned under ARDC reorganization, the new division is based in Washington and is commanded by Brig. Gen. Benjamin G. Holman, former commander of Air Force Office of Scientific Research. Col. A. F. Gagne succeeds Holman as head of AFOSR and this becomes vice-chairman of ARDC. New division includes AFOSR and the ARDC Headquarters in Boston.

Chair of a Belgian air force fighter, delayed since Dec. 24 by a new French proposal on the Dassault Mirage IIIC fighter, may be made this week. Decisions as to the heads of its special mission opposition Jean du Sablon de la Perrière. Belgian sources expect the group in turn represented in the new fighter's program.

Korean Aircraft Corp. has received a second 554 million billion on contract from the Navy's Bureau of Weapons for production of HU-16A helicopter. Captain CL-41 jet trainer (AW Nov. 29, p. 79) has first flight last month. First in the MacCready, receiving first pilot, the airplane was in the air 1 hr. 5 min. It is powered by the Pratt & Whitney JT12D-2 turbojet engine, and is the first airplane to fly with the engine other than a turboprop.

Florida Market Stirs Stiff Competition

Advent of jet transports, plus anticipation of a good traffic year, will result in increase in seat capacity.

By Glenn Garber

New York-Atlanta serves the Florida market expect a strong winter season this year, but face heavy competition among themselves as several carriers speed activity, no recently awarded routes.

Route awards to four carriers, effective late in 1968, resulted from the Great Lakes Southeast Service Case of the Civil Aeronautics Board. Foothills of the additional competition should be felt this season.

The apparent consequences is firms that winter, too, with three others of route operating jet equipment to the Florida market and two others about to enter the jet. With these bigger planes and in anticipation of a good traffic year in the market, the individual airlines are increasing seat capacity by as much as 40%.

For the past two years, the pattern of the Florida market has been disrupted by unusual circumstances that Florida Airlines and Delta had to withdraw in the 1967-68 season and a late entry against Eastern Air Lines in December 1968, just as the carrier was about to inaugurate service with its Lockheed Electra turboprops.

Traffic Outlook

Here is the situation this year in each carrier area:

- Capital controls the market for the first time in December, 1968, with seven new firms: Cleveland to Miami and from Grand Rapids, Lansing, and West Allis via Cleveland. The airline system has added new routes from Newark, N. J.; Buffalo, Pittsburgh, Akron-Canton, and Youngstown, and operates nonstop flights to other Florida cities.

For the 1969-70 winter season, no major new, Capital has inaugurated nonstop from Buffalo and has increased its service from Pittsburgh and Cleveland to Florida. Seat capacity this winter is up 49% to 5,374 weekly seats, and east and west.

Capital operates all its first class and extra comfort flights with four-jet Douglas DC-8s. The coach schedules, anomaly of which has 72 seats, Lockheed 649 Constellations, but these will be replaced beginning Feb. 7 with Martin Douglas DC-6B equipment leased from Pan American. Capital expects the seven, DC-6Bs to be phased out by mid-March.

The carrier won't be operating jets this year, but expects to have Convair 880 jet transports for the 1969-70 season.

points and other cities. Last year's peak was 63,751 seats. Eastern has felt the competitive bite in several places, but turned because of the strike, but, entry into the jet picture, and new overloads over several routes as a result of the route case. Without point the loadings taken out of the low fares, the service performance last year became the first domestic market of straight jets and gaining a share of the Eastern.

Eastern's lagging of the jet sales appeal to some extent with its new Electra was blamed by the strike, and Electra had factors built up early after the strike ended. Then Eastern waited for Pratt & Whitney 757-jets and DC-10s, accepting later delivery rather than the powerful DC-10 with 757 engines. First service was scheduled for Jan. 26 with the jets, but of which was deferred early this month.

Flight Frequency

Initial frequency will be one daily round trip between New York and Miami, with more schedules added as airplanes are delivered and training completed. But Eastern's other than jet schedules total about 115 flights, in and out of Miami. These include 96 New York schedules, 34 Chicago schedules and 38 Atlanta schedules, these points showing Eastern's largest segments in the Florida market. Its popular first schedules 40 Electras.

Eastern says it will maintain Florida's round trip service during the winter season of 1969-70 and expects to top that total of 200,000 this winter. The Florida market, however, has been cut over somewhat, according to Eastern, by the increased accessibility of more distant tourist areas with jet travel. The airline rates the Chicago market as an example, with some potential Florida business diverted to Illinois.

Nevertheless, Eastern's growth bookings will up the season and expects to hold its own in the competition.

- Northwest will increase its capacity, to 10% this winter for a weekly total of 46,144 seats, and a total of 104,000. The Boeing 727-200 jet, operating under its new Pan American name, is to join New York-Miami round trip schedules a day. First of three DC-10s is expected to start Jan. 26 and go on the New York-Miami run Feb. 12, according to present plans.

With delivery of the second DC-10, expected late next month, Philadelphia-Miami jet service will be integrated

and New York-Tampa DC-10 service will follow. Delivery date of the third will follow.

In Mar. 1, Northwest expects to be flying six round trip jet flights daily to Florida. Other equipment includes Electra, of which Northwest's first total 12, and DC-10, DC-7B, DC-8s and 101H Convairliners. As of Feb. 1, Electra will make up 37.5% of Northwest's Florida jet, jets 16% and passenger planes the rest.

Northwest's jet load factor for December averaged out at 73%, with the loadfactor seats 94% filled.

- Northwest will increase its available weekly round trip flights on the available 73, from 6,184 to 6,887 this winter. Last month Northwest entered the jet competition with one New York-Miami round trip daily, then with leased Trans World Airlines Boeing 707-320 equipment. Whether or not the frequency of this service will be increased depends on the availability of additional TWA jets.

Load factor for the last two weeks of December was about 95% northbound, 90% northbound in the big jets, or better than 70% in both directions. All other Florida schedules are handled in DC-6Bs, which Northwest has in a maximum of 10.

- Northwest will add aircraft to its equipment of its own in 1969, jet airplanes will join Convair 880s in the new fleet (AW 1/19, p. 47).

- Northwest will offer 6,852 seats weekly in both directions between Miami and the Midwest, up from 5,526 last year. Eight daily round trips will serve Chicago and Minneapolis-St. Paul and Milwaukee. All flights will be operated with Electras, except one DC-10 schedule. The airline originated Florida routes in December, 1970, following the route case.

Equipment for the route last year was DC-7C, DC-8 and Boeing 727s. New service this season will include a nonstop from Milwaukee to Miami and service to Ft. Lauderdale via Florida.

Northwest expects to put DC-10 jets into the Florida market next spring. The market expects traffic interests on the route the season ending in one year expansion and establishment of the route.

- TWA picked up a St. Louis-Orlando route in the CAB case and has started operating it in January. Four daily flights initially originate in Miami and terminate at St. Louis, but each goes out again immediately on another flight. For example, the main Boeing 727-200 flight spends 30 min. on the ground at St. Louis and then off to Los Angeles, albeit under another carrier flight designation. One Lockheed 1649A Constitution goes on to Kansas City, another 1649A and a

Super G continue to San Francisco. Other carriers have taken TWA's to court, objecting to the CAB's failure to effect same plane transcontinental eastbound service but awarded to the Florida route award. A U. S. Court of Appeals decision recently affirmed the route to CAB, but the court granted a stay to allow Trans World Airlines to appeal to the U. S. Supreme Court.

TWA daily seats each way between Miami and St. Louis are 317 this year, up from 297 in 1978.

Quesada Says Laxness Indicated In FAA Aviation Safety Survey

By L. L. Doty

The recent National Airlines accident near Boston, N. G. (Jan. 11, p. 5) was expected into the hearings in an issue during continuing questioning of Quesada, indicating that the National DC-10 distinguished as the one because of the severe nature of the accident. The question concerned the lack of cabin lighting, the staff and approach skill minimization, the pilot's right to telephone to Quesada, among that they would relate to take preference checks until FAA rules were revised.

Quesada told the senators that policies should, which he said as conducted by National and not by FAA, did not make an announcement which placed airline status on an aircraft. He admitted that if an airplane went through staff and briefing situations which could be a hazard but stated that any pilot who allowed an airplane to board would be disqualified immediately.

L. W. Deneen, National vice president-operating, told Aviation Week that the DC-10 involved in the accident had not been used to preference

New Aid Legislation?

Washington-Demand to propose legislation that would empower the Federal Aviation Agency to confront imports at once, suspending entitlement to a point that would impinge. This, in turn, whenever local authorities failed to provide insulation for the installation of adequate segregated aisle was made last year by Sen. S. E. Mike Mansver (D-Calif.) and his congressional colleague.

More is referred specifically to New York's La Guardia Field where TWA's programming for a normal B-737 and light aircraft approach lights have not been supplemented because of a conflict with sleeping interests over night-awake in Elbow Channel where the equipment must be installed the effective use.

tests for at least three months. Most often we can conduct module at the time the tests are conducted for the proficiency tests.

In discussing the National pilots' return to the proficiency check until January, Quasada said, "I am changed. Quasada worried that if they do not fly the proficiency tests, they will not fly.

Airline Liability Cited

In charge of his career she has been his and maintains in the maintenance area, Quasada brought test flight examples.

* **Violations** have been reported showing that certain carriers on occasion have refused ascent for operations without required equipment or with the required equipment lost.

* **Aircraft** sometimes have released from monitoring in an emergency condition due to failure to initial necessary pitch or thrust reverses was performed in an emergency manner.

* **FAA** findings on maintenance procedures within the flight test and do not concern with the airline on the issues raised resulted in a reorganization of the inspection's enforcement activities. FAA is currently discussing with another major carrier defensives based on its method of operation.

In answer to a question as to whether FAA has ever conducted an investigation of an emergency certificate, Quasada said, "Yes." When asked if he had ever actually done one, Quasada replied "class size." He said such action would be given very serious consideration because of the major effects it could have on both the carrier involved and the regulator.

Quasada said that inspection of all types of operations—general and air carrier—was conducted in the filing of 3,834 violation reports during 1976; an average of 100% over the number of violations made in the 1975 fiscal year. He said that the review school has been taken in 1,978 of these violation reports.

In connection with the suspension of or in control of all types of certificates Quasada said that during 1977 the agency issued 910 safety inspections or revoking certificates. Of these, only 50, or about 5%, took advantage of their right to appeal to the Civil Aeronautics Board.

Asked the stand taken by Quasada during the hearing, Sen. George Smathers (D-Fla.) reported that he had received about 10 telegram from pilots of two aircraft containing similar changes but said he could not recall any specific ones cited after a "comment" on the telegram.

On his return testimony, Quasada made no specific references to ALPA or to other associations and unions representing industry which he said "exists" but there is a need for an effective discipline program. That is, Quasada urged the airline industry to give "this matter high priority."

Aviation Act Review

Washington—Complete review of the Federal Aviation Act was described as one of the most important tasks facing the House Committee and Foreign Committee Committee during the session of Congress by Chairman Rep. Otto Henshaw (D-Ala.), last week.

Plans and the review will be made by the Subcommittee on Transportation and Aviation headed by Rep. John Bill Williams (D-Ala.) and is expected to be completed within the next few months. He and his staff will be given open possibilities for codification of all safety and responsibility laws, the Federal Aviation Agency inspection and operations, airline compliance with FAA regulations and whether enforcement is being properly maintained.

Other questions to be raised, he said, include the function of used aircraft, how to use to jet aircraft standards and any delay being caused under present operations.

Quasada, or whether it is essential in the safety of air operations at FAA were. Quasada informed at his news conference he had reported elsewhere that the staff enforcement program is conducted entirely "for the public interest."

As of Dec. 1 last week, the Air Line Pilots Association had 1,000 flight attendants, Quasada noted, and 1,000 technicians, but one ALPA spokesman told *Airline Weekly* that "we still are taking steps to take the stand" specifically early this week.

Union Attacks

The union has not research forced its attacks against Quasada but has claimed that it terms harassment tactics of FAAs inspection. In his testimony, Quasada challenged ALPA to bring out specific examples of harassment, but he said the union was not able to do this at the time. He did say that during the month of December when inspection was accelerated, 210 of 135 of the 4 million hours airline pilots flew in one month was the amount of time inspectors spent in airline aircraft each day.

During the hearing, Sen. George Smathers (D-Fla.) reported that he had received about 10 telegram from pilots of two aircraft containing similar changes but said he could not recall any specific ones cited after a "comment" on the telegram.

On his return testimony, Quasada made no specific references to ALPA or to other associations and unions representing industry which he said "exists" but there is a need for an effective discipline program. That is, Quasada urged the airline industry to give "this matter high priority."

poor incentive and intercepts attack which I can only regard as an effort to subvert the agency and distract our attention to serve the public." This is how he described his concept of the public interest.

It "includes the many millions of people who live on the ground and merely risk protection from the aircraft."

It includes the 90 to 60 million of people who travel by air. It also includes what might be termed "the aviation community."

General Aviation

In a reference to general aviation, Quasada noted that, during 1976, "positive pilots were involved in a total of 272 single accidents in which 345 pilots and passengers were killed and 155 seriously injured." Of these accidents, 138 (or 49%) resulted from attempts to cope with emergencies which developed suddenly on route, such as buzzings, loss of control in instrument conditions and collisions with objects in reduced visibility.

It was for these reasons, he said, that regulations have been changed to require some instrument training for private and commercial pilots.

Key to most of the issues at stake is the FAA's position on enforcement which Quasada defined as follows:

"Enforcement is the tool or weapon by which we command respect for and adherence to our safety standards and rules. But that does not mean we need force. We can, for example, under the law have a prominent place for our enforcement policies." (AW Dec. 3, p. 171)

Quasada said that only a minimum fuel to comply with safety regulations, adding that "a policy of strict enforcement, with no leniency to the irresponsible few who corrupt the lenient, would quickly evidence compliance by the responsible majority."

It was through this reasoning, Quasada's testimony that he places enforcement at a high priority and that it is a process of safety inspection.

He said that in 1976, in the type of single-engine aircraft and approach facilities being used, CAB also recommended that 20 aircraft be assigned to establish light simulator training programs prior to integrating service with planes with new and different operational characteristics and that flight simulators be installed on all aircraft-powered aircraft.

Again, Quasada's most recent update of Civil Aerodynamics Board Chairman James Duerre, who in earlier testimony told the subcommittee that special aircraft should be placed under permanent bonding and grounding, said that there is a need for an effective discipline program. That is, Quasada urged the airline industry to give "this matter high priority."

CAB Details Causes of Electra Accident

By Robert H. Cook

Washington—Failure of two American Airlines pilots to properly maintain their flight instruments was cited by the Carl Aeronautics Board last week as the primary cause of the crash of a Lockheed Electra turboprop transport jet February during an approach to landing at La Guardia Airport in New York.

Board members also listed six other contributing factors to the accident which claimed the lives of 153 passengers and two crew members when the twin-engine jet left the East River at 4:59 p.m. in about 10 minutes and 619 ft. in sight of the reduced ceiling of La Guardia's Runway 22 (AW Feb. 3, p. 18). Five passengers, 57 years old, 31.5 ft. from the end of Runway 22, Atkins helped out of tower permission to land straight in, the last message from the aircraft, was received at 27 sec after 11:55 p.m. Seven seconds later, the aircraft crashed.

Contributing factors cited by CAB were:

- Limited experience of the crew with this type aircraft.
- Faulty approach technique in which the pilot attempted to complete a landing approach by using the autopilot rather than by manually operating the controls.
- Incorrect setting of the captain's altimeter.
- Minimal weather in approach area.
- Possible misinterpretation of altitude and use of dashed indicators.
- Sensors thrown on bright and altitude of the aircraft resulting from visual reference to a few lights visible in the approach area.

Board Recommendations

As a result of its investigation, the Board has recommended to the Federal Aviation Agency that autopilot approach procedures be used in all types of aircraft, except for the types of single-engine aircraft and approach facilities being used. CAB also recommended that 20 aircraft be assigned to establish light simulator training programs prior to integrating service with planes with new and different operational characteristics and that flight simulators be installed on all aircraft-powered aircraft.

Again, Quasada's most recent update of Civil Aerodynamics Board Chairman James Duerre, who in earlier testimony told the subcommittee that special aircraft should be placed under permanent bonding and grounding, said that there is a need for an effective discipline program. That is, Quasada urged the airline industry to give "this matter high priority."

enforcement needed to duplicate every flight disseminate and standardize maintenance procedures.

Recommending the immediate CAB is to grant American's Flight 100, en route from Chicago and commanded by 39-year-old Capt. Frank H. DeWitt, clearance to make an instrument landing on the back course of the La Guardia Runway Landing System because of weather conditions which included a ceiling of 400 ft., a one-mile visibility and low rain and fog. While descending from 3,000 to 2,000 ft., Flight 100 made a 60-second approach, setting up 39.7° from the Runway 22 centerline, descended at 1,000 ft/min, and 619 ft. in sight of the reduced ceiling of La Guardia's Runway 22 (AW Feb. 3, p. 18). Five passengers, the pilot's copilot, flight engineer and a stewardess survived.

Contributing factors cited by CAB were:

- Limited experience of the crew with this type aircraft.
- Faulty approach technique in which the pilot attempted to complete a landing approach by using the autopilot rather than by manually operating the controls.
- Incorrect setting of the captain's altimeter.
- Minimal weather in approach area.
- Possible misinterpretation of altitude and use of dashed indicators.
- Sensors thrown on bright and altitude of the aircraft resulting from visual reference to a few lights visible in the approach area.

Crew Testimony

Surprise crew members testified that during the approach the captain was flying the aircraft by the autopilot, but with Capt. Frank H. DeWitt, 39, in command, he had landing committee times, arrested by the captain, while Flight Engineer Wayne A. Cook controlled the flight. The captain of an uncrewed aircraft, he said, would descend at 1,000 ft. from his altitude by calling out 600 ft. on his altimeter to call off 600 ft. and on approach of 135 ft. Glancing out his right-side window, the captain said he then saw some red lights just below the level of the cockpit. Just before he could again read his instruments to call off 300 ft., the Electra struck the water.

Later, the flight engineer testified that he had been flying the aircraft when he saw a red light on the altimeter, he saw one or four white lights and thought the aircraft was unusually low. Reiterating the captain's testimony, Cook said he noted that it indicated a little above 500 ft. immediately prior to impact.

Surprise crew members also stated that visual contact was never established through the forward windshield. The windshield wipers were off, failing light intensity, and the cockpit windows were not cleaned and the sunvisor was off. While the Board did not attempt to blame the accident on any one primary factor, it pointed out that Capt. DeWitt's autopilot approach was not in accordance with American's Electra operating manual instructions, which require the pilot to be disengaged as a final check and procedure prior to relying on an instrument approach. CAB also

said that use of the autopilot's design features for approach requires a glide slope angle which was not available. Also, the La Guardia back course was 11.4°, thus requiring DeWitt to change his altitude settings by reference to the altitude.

Aircraft setting at the captain's altimeter of 200 ft, according to CAB's investigation, compared with non-pilot setting of 29.7°. This error plus dislocation for static air correction would cause the American captain's altimeter to read from 110 to 125 ft. higher than the actual altitude.

The Board said that both the altitude and rate of descent increased before the Electra went down to the right course and could easily have been avoided.

The report also noted that Capt. DeWitt's ground training had been conducted with a conventional aircraft and standard altitude setting of the instrument actually installed in the Electra.

Under standard procedure, CAB uses non-pilot equivalent, such as the down altimeter, light dimmer switch and attitude switch in the Electra that confirm when the instruments match, but that he could not do this with the standard cockpit instruments. The Electra had standard attitude and heading reference in fact to fly the Electra and the purchasing airline it flew to operate it.

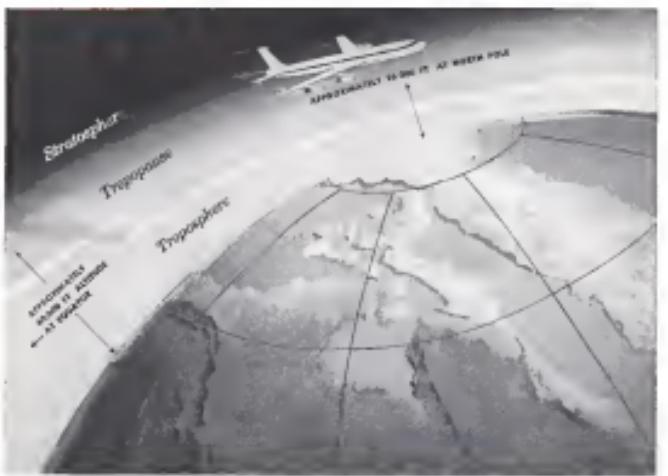
Look of Service Testing

Noting the bulk of air service testing or quality control specifications under the TSO system, CAB said FAA it thinks "Service testing of novel designs before flightworthiness is achieved and would be an instrumental in advancing design selection in the present aircraft." The report of a panel of industry and control standards on the TSO and related aircraft certification of the certification quality control organization is by FAA inspectors would under strict high quality products getting lots notice. The Board also observed that clear documentation of minor deficiency reports on service TSO items would detect much before a serious problem arose.

The Board said, however, that the responsibility of overseeing the aircraft could not be determined as the manufacturer, the supplier, and the operator's position will depend on the number of flight instruments as a component. While both the pilot and co-pilot were "preoccupied" with the landing, CAB said, the co-pilot could have been presented had the captain. Also, lowered presentation operating procedures, and been fully alert and sensitive to his

POLAR FLIGHTS

Low Arctic Stratosphere on Polar Flights . . . Provides Warmer High Altitude Temperatures than in Tropics!



THROUGH a lower troposphere and resulting lower stratosphere, temperatures above approximately 20,000 feet in the polar regions are usually colder than they are in comparable latitudes in tropical regions—and they usually vary much more between minus 40 to minus 10 degrees Celsius at jet altitudes. But just as the polar regions are the coldest, they are the warmest in the stratosphere for the largest part of their journey.

Knowledge of polar weather conditions at high altitudes makes possible those extreme long-haul flights on regular schedules. These flights will be the most exciting flight planning. And, of course, available access to the coming flight planning on high-quality facts and forecasts.

Just as the first Mobiljet 150—an ideal long-range fuel—already proved for high performance airline operations, Mobiljet 140—a performance proved airline jet fuel with -40 F Beaufort Point

Mobil
MOBILJET FUELS
MOBILGAS AIRCRAFT
MOBILOIL

Mobil Oil Company, A Division of Socony Mobil Oil Co., Inc.
 150 East 42nd Street, New York, N. Y. 10017

dates throughout the approach."

The Board and its members had completed their first flight in the Arctic region during the 1960 polar research season, and DeWitt theorized that Electra would be forced to descend and cut out if it passed and altitude below 600 ft because he probably was experiencing breaking out beneath the aircraft and, having seen some ground lights, was focusing on visual identification of the airport instead of monitoring the flight instruments.

Criticizing the experience of the Electra crew members and American operators, Captain DeWitt said, "Captain DeWitt had about 40 hrs in the Electra at the time of the incident. He had 10 hrs of training in the Electra, 10 hrs of which 5.5 hr are devoted to aircraft systems and 16 hrs to operations and performance.

The pilot's first type rating check for the Electra was made after eight hours of flight training, but DeWitt failed a portion of the check and returned to successfully pass his type rating and to attain check after 12 hr. of training on the Electra aircraft.

CGI noted that American operators' specifications require post-takeoff roll and visibility holding minimums to be increased by 100 ft as ceiling or visibility half mile is reached. The polar air schedules service limit 100 ft. as captain in the aircraft is reached. Regional Superintendent of Flying considers the requirement and certifies the pilot is qualified to operate at polar service minimums.

If these restrictions are to serve as a good guide then to give the advantage of a conservative flight operation policy, the Board questions that wisdom of the decision in exempting Capt. DeWitt when he had but 12.5 hr. of flying the Electra in scheduled operation, the Board said. "This generated new safety rules when the accident report has asked the FAA to determine whether the lower position should be deleted from operation specifications."

CGI particularly criticized the air line for failure to include the risks of altitude and rate of descent resulting in the ground impact program and for the lack of a comprehensive aircraft maintenance program for the Electra.

Expressing concern over the absence of an inspection program, the Board and administration of the Electra had discussed this omission since "almost all

airline operational aspects of air and substantially different equipment, we think, are not present, could have been tested through the Electra aircraft or training in an aircraft simulator." CGI said that FAA had been asked to expand completion of such simulator training programs by pilots before approaching their assignment as pilot in command.

American Airlines and last week the Board ordered the Electra mandatory more than two years ago and expected to take delivery of it about a year ago last that that far, the airline's position has failed to cover either the aircraft or FAA's performance requirements. The carrier now sits at non-SAC as occurs due to lack of flight test experts to take delivery of the aircraft.

The Board also urged FAA to acquire the qualification of flight instructors on oil-turbine powered aircraft to provide a continuous check reading of time, speed, altitude, vertical acceleration and heading as an aid to diminishing accident rates with greater precision.

New York Airways Orders 10 V-107s

NEW YORK—The Vickers 107 turboprop jetliners have been ordered by New York Airways, with the first due expected to go into service in the spring of 1965.

The jetliner's unique personality had led airline operators on line of the transatlantic aircraft (AW Nov. 8, p. 47) for early 1965 delivery. This counted the first for production models of the aircraft. Remaining five in the firm's order will be delivered by the end of 1965.

The V-107, scheduled for service next year will provide capacity for 96 passengers in a semi-furnished cabin or 100 passengers in a basic cabin. The Vicks V-107 is being built by New York Airways President Robert L. Gurney. The first set of 107s will therefore consist of 150 million seated passengers.

Connings and the 25 passenger jetliners will cruise at speeds above 150 mph, cutting flight times from Newark Airport to La Guardia Airport from 14 to 9 hrs., as one example. Right-angle engine installation permits a minimum distance requirement between the turbine exhausts, which will cut airline savings on the schedule, Gurney said.

Commercial jetliners now operate over 50 hrs., Connings said, and speed and availability of the new fleet will allow schedules every 25 hrs. By 1962, the airline will be flying "with minimum interference from the weather" as a result of instrument approach experience, according to the New York Airways official.

Availability of the firm's Rotoliner VTOL in late 1964, Connings said,

will permit further expansion of service "in a second business line." New York Airways has signed a letter of intent to have the Rotoliner

FAA Requires Radar On Airline Transports

WASHINGTON—The Federal Aviation Agency last week adopted a new rule requiring the installation of airborne weather radar on a majority of passenger jetliners as a means of preventing aircraft accidents caused by severe air turbulence.

Installation is required by July 1 on all turboprop and turboprop/turbine aircraft, including the Douglas DC-8, DC-9, and DC-10, the Lockheed L-1011, and 264 miles, and by June 1, 1967, for all other transports, including the Boeing 727, Convair 880, 940 and 1000, Lockheed 1049 and 149, Martin 222 and 244, and the Douglas DC-4.

Excluded from the rule but being seriously considered by the FAA for later adoption, are the DC-3, Lockheed L-1011 and the Convair C-46, all of which are categorized under a non-turboprop category not covered in the original rule.

The rule also excludes transports and aircraft with foreign engines, foreign racing or ferry flights, small aircraft, aircraft operated in Hawaii, Alaska, where thunderstorms and other parts of the country where weather conditions do not cause radar track errors.

FAA said it excluded the DC-3, L-1011 and C-46 because they do not fit the "transport category" wording of the ruling.

In a further move to attack FAA ruled that after May 11, all transport category aircraft equipped with airborne weather radars must not be departed under instrument flight rules or night takeoff/night landing when hazardous weather conditions are reported in the radar units are in working order.

Should the radar fail while en route, the aircraft must be operated in accordance with instrument flight rules specified in company operations manual approved by the FAA for such an en route.

Landing Gear Forces American 707 Abort

NEW YORK—An American Airlines Boeing 707-130 jet transport crashed in a field but took no human life after takeoff when its landing gear failed to retract.

The scheduled flight took off about 4:45 p.m. and its pilot was unable to retract the gear. Low fluid pressure in the gas leaking cylinder had activated an automatic cutoff which stopped the retraction cycle.

Davis Leaves FAA

William C. Davis, former director of the Federal Aviation Agency's Bureau of Flight Standards, has resigned to accept a technical position with American Airlines. Oscar Banks, manager director of the Civil Aerodynamics Board's Bureau of Safety, has been named to replace Davis.



10 MILLION HOURS IN AIRLINE SERVICE

have been flown by
ROLLS-ROYCE GAS TURBINES



Monroney Introduces Cargo Aircraft Bill

Washington—Sen. A. S. Mike Monroney (D-Ola.), chairman of the Senate Committee on Small Business, introduced legislation aimed at expanding the aircraft cargo stripe capacity by authorizing the Civil Aeronautics Board to guarantee loans for the purchase of aircraft. Monroney first introduced his plan for such legislation last fall (AW Oct 26, p. 31).

Edward B. Quisenberry, Federal Aviation Agency administrator, indicated that the Administration will support the measure.

Under Monroney's proposal, a single airline would be eligible to obtain a guaranteed guarantee on loans of up to \$75 million for the purchase of cargo planes and up to \$18 million for the purchase of "essential components of a cargo airfield system." The guaranteed loan could not exceed 75% of the purchase price of the aircraft and would have to be repaid within 10 years.

Both Monroney, in a Senate speech, and Quisenberry have argued a single expanded subsidy is capable of fueling the industry.

Monroney declared that "the indispensable element in preparation for broad air transportation is visibility and in the desire of the states, military mobilization and military strength."

Quisenberry said that "as government, we are trying to create the climate to facilitate the development of a dynamic national air cargo industry" and urged the industry to "face up" to its responsibilities. He reported that FAA also is studying government guarantees of loans for cargo aircraft purchases and leases.

"These loans, in conjunction with the ability of substantial quantities of aircraft to move air cargo traffic by the civil air service, would greatly stimulate the air cargo industry and provide an incentive in modernizing the present fleet and greatly expand its capability."

The Monroney bill directs government departments and agencies to make "an immediate and orderly transfer of existing quantities of routine government-owned equipment and cargo traffic to the privatized air carriers."

Monroney said there were three key developments:

• A comprehensive report by the Department of Defense making recommendations on the operations and re-organization of the strategic fleet of Air Force's Military Air Transport Service has been submitted to the White House for review and is expected to reach Congress next month. Monroney urged MATS to transfer its routing, logistic functions to commercial carriers. Quisenberry noted that "to the extent that de-

velopment and production expenses can be spread over the largest number of units, by both military and civil government, unit costs will be proportionately reduced. The dollar savings to both the military and civil service would be substantial."

• Federal Aviation Agency, Air Force

and commercial air carriers are approaching agreement on the acceptable damage classification of less than cargo aircraft. The carriers for shipping and receiving aircraft are reporting an FAA poll of the airline industry, Quisenberry said. "The replies are starting to come in and the response is greatly encouraging. The air carriers are extremely interested in developing the air cargo resolution and are looking forward to the availability of efficient, economical cargo aircraft to depth penetrate the potential."

Local Prerequisites

A prerequisite for a loan guarantee under the Monroney measure is the proof of the design of the aircraft to be purchased by the Federal Aviation Agency, administrator and the Secretary of Defense. Another requirement is that the aircraft be available to Defense Department in an emergency, and during the period of the guaranteed loan he said "promptly" for transport of cargo and mail.

Quisenberry declared that it is "disconcerting" that less than 50% of the 600 turbine-powered aircraft the U.S. are

now will have on their inventory. In 1967 well be widespread."

Noting that the Defense Department has more "hundreds of millions of dollars" by switching from surface to air transport for logistic support, Quisenberry predicted that businesses will follow the example.

He said:

"In the future, by using efficient, automated cargo aircraft in a reasonable time, a great amount of man-hours, human effort will be able to reduce inventories, reduce or eliminate warehouse and depots, and labor requirements, handling and storage charges and where lower capital investment costs. Second, forward thinking companies are doing this now. But the gap between future use and surface transportation uses rates must be dramatically narrowed for this type of total distribution cost sharing to pay off."

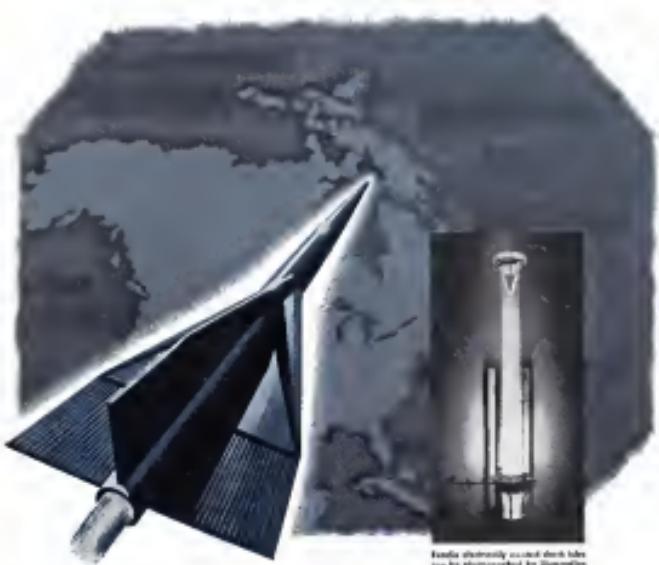
Quisenberry and Quisenberry, chairman of the Senate Small Business Committee, from the starting point to the development of a national air cargo industry with commercial performance characteristics, could help prevent operating costs and rates.

He added that a substantial expansion of air cargo "is of compelling importance in furthering our foreign efforts." In the event of dismantlement, he said, "the development of a national air cargo industry would be a great boon by partially utilizing facilities and manpower released from armaments production."



Eastern Schedules DC-8 Service Jan. 24

Eastern's DC-8 freighter transport will begin commercial service Jan. 24 on Eastern Air Lines New York-Milan route (AW Jan. 11, p. 40). Photo above shows cabin interior looking through first-class compartment, with two-thrust seating.



Kondia ultraviolet shock tube
can be photographed by fluorostimulation
from hot gases.

PLASMA PRODUCTION

... for magnetohydrodynamic investigations

Hypersonic flight can generate ionized shock layers with free electron densities as great as 10¹⁷ particles per cm³. Temperature near the stagnation point can be as high as 7000°C. This is the self-generated environment of a missile or aircraft traveling at Mach 30 in the upper atmosphere.

To create these conditions in the laboratory for magnetohydrodynamic and electromagnetic propagation investigations requires a hypersonic wind tunnel. The BENDIX Kondia[®] shock tube is a unique facility. Injection of a capacitor bank into a metal canister at one end of the tube instantly creates a shock wave which is driven down the length of the tunnel past the test body. Flow velocities up to 75,000 fpm and temperatures of 20,000°C can be generated.

By passing electric and magnetic fields through the plasma in the shock tube, BENDIX engineers can measure the effects of radio transmission through the heated layer surrounding hypersonic vehicles. They can also investigate the acceleration of conducting gases for space propulsion, and the heating at close encounter of thermal energy to electrical energy.

Plasma production is one of the projects being carried out by the BENDIX Research Division to solve the technical problems which are the keys to the progress of the future. Other investigations include satellite communications systems, navigation methods, advanced infrared reconnaissance, and the EAGLE Air-to-Air Missile System. Research are carried from basic engineers also looking to the future.

Bendix Systems Division

300 South Grand Avenue



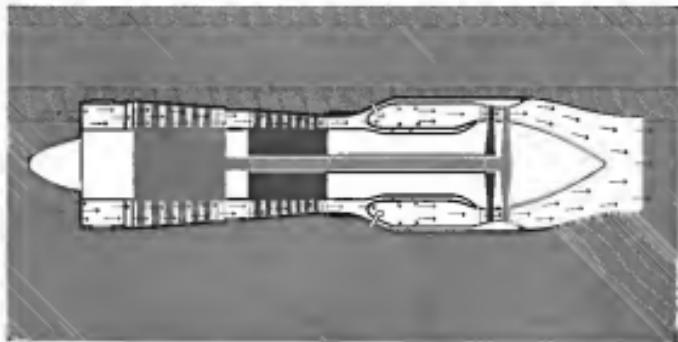
Airline Traffic—November, 1959

	Domestic Passengers	Revenue Passenger Miles (000s)	Load Factor %	U. S. Mail	Express	Postage	Postal Revenue (000s)	% Revenue to Domestic Total
DOMESTIC TRAVEL								
American	467,371	461,729	68.1	1,314,108	817,291	6,372,311	45,741,789	52.1
Delta	173,207	74,494	83.2	355,157	10,200	502,761	4,981,389	44.2
Capital	203,419	121,795	78.7	434,123	261,820	12,734,206	36,323	30.3
Continental	97,445	41,303	68.8	134,177	10,148	216,267	4,424,313	38.7
Delta	100,222	100,222	68.8	134,043	20,200	285,100	4,424,313	38.7
Air Florida	142,316	87,201	68.8	301,569	83,447	976,800	5,493,169	54.3
Midwest	94,359	34,684	68.8	702,526	40,027	115,644	2,444,623	20.8
Trans World	144,446	144,446	68.8	301,569	83,447	976,800	5,493,169	54.3
Trans World	474,611	321,260	68.8	1,672,307	708,919	8,033,019	46,912,589	54.4
United	207,307	216,713	81.2	1,877,126	475,739	3,121,365	56,921,509	59.4
Western	148,448	73,844	68.8	307,123	71,073	274,793	4,149,178	30.3
INTERNATIONAL								
American	8,220	8,220	89.6	9,580	511	135,811	1,891,305	58.7
Delta	3,407	4,172	87.2	32,448	19,000	1,997,300	1,891,305	58.7
Continental	1,120	1,120	87.2	1,729	2,207	4,712,209	15,851,403	30.4
Delta	2,475	1,100	89.8	6,200	24,207	4,712,209	15,851,403	30.4
Trans	39,376	41,275	46.41	71,575	158,043	4,781,150	96.99	96.99
Midwest	8,368	8,368	86.4	7,500	1,400	1,200,000	1,200,000	100.0
Trans World	1,141	1,141	87.2	10,329	3,421	40,737	305,277	27.3
United	11,455	11,455	86.4	11,455	10,344	1,160,269	3,795,177	30.3
Trans	4,251	4,251	86.4	1,355,049	121,200	1,891,316	1,891,316	100.0
American	82,478	120,023	89.7	1,397,509	2,344,709	14,581,403	1,891,316	10.4
American	90,210	103,205	86.2	455,194	4,846,707	15,851,403	1,891,316	10.4
Trans	10,739	65,163	79.2	74,412,304	2,047,197	13,021,200	100.0	100.0
Trans	10,944	16,136	86.4	73,569	1,400	1,200,000	1,200,000	100.0
Trans	8,440	8,440	86.4	1,442,173	10,344	1,160,269	3,795,177	30.3
LOCAL TRAVEL								
Alaska	46,261	8,363	62.9	11,602	23,112	31,402	911,809	48.8
Arizona	19,022	4,728	85.9	7,442	2,149	6,941	4,526,662	48.2
Central	12,545	3,460	54.7	6,140	3,491	7,036,421	31.3	31.3
Frontier	26,111	8,840	56.4	32,301	10,457	29,263	733,809	41.8
Latin Central	11,141	11,141	54.7	1,218	2,111	2,111	2,111	48.2
Midwest	29,727	7,371	58.6	12,118	72,362	20,981	576,260	57.6
North Central	72,031	12,771	46.41	97,579	95,120	29,219	1,329,104	91.0
North	44,112	7,771	58.6	15,125	22,729	22,729	22,729	41.4
North	10,454	10,454	58.6	12,779	72,476	72,476	72,476	50.0
Midwest	32,456	7,793	58.6	12,528	12,770	12,770	12,770	91.1
Midwest	21,255	8,140	58.6	11,923	11,213	15,888	422,387	38.8
Texas-Texas	23,734	3,027	58.7	19,576	11,410	28,248	489,872	38.8
West Coast	39,216	8,794	68.42	12,519	4,704	12,734	6,543,943	21.73
MANUFACTURE								
Alaska	21,150	4,652	64.5	5,361	2,416	281,402	47.6	47.6
Alaska	41,112	8,332	68.8	13,557	204,574	917,526	917,526	100.0
CHICAGO AIRPORT								
Alaska and American	1,226	1,471	81.6	50,023	73,026	8,309,390	8,309,390	64.49
Flight Tug	1,226	1,471	81.6	50,023	73,026	8,309,390	8,309,390	64.49
Midwest	5,304	5,304	81.6	5,304	1,206,371	1,206,371	73.7	73.7
Midwest	5,304	5,304	81.6	5,304	1,206,371	1,206,371	73.7	73.7
Frontier	475	2,633	88.13	6,261,941	4,698,111	4,698,111	47.18	47.18
HELICOPTER USE								
Chicago Helicopter	35,181	348	93.4	507	3,063	30,645	46,217	46.0
Los Angeles-Hollywood	2,076	944	22.9	4,201	4,201	4,201	4,201	100.0
New York-Albany	2,076	312	22.9	1,208	1,208	1,208	1,208	100.0
New York-Albany	90,171	90,171	93.4	3,063	3,063	30,645	46,217	46.0
ALASKA AIRLINES								
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371	24.2	3,215	3,215	3,215	3,215	100.0
Alaska Airlines	6,770	7,192	24.2	41,807	3,093	30,645	1,149,733	28.3
Alaska Airlines	371	371						

Olympus turbojet - high power, low fuel consumption superb handling qualities, great development potential ...



...ANOTHER ENGINEERING ADVANCE BY BRISTOL SIDDELEY



One of the largest manufacturers of motive power in motion the world, Bristol Siddeley Engines Limited produce the Olympus. The Olympus is one of the most powerful and efficient high-thrust turbojets in service, and therefore performance details are severely restricted. It can be said, however, that the Olympus possesses outstanding handling qualities. In a climb acceleration to full power from ground idle, it is considerably better than the official requirement. It also has one of the lowest specific fuel consumption and the highest thrust/weight ratio of any type-turbine zero engine in its class.

The Olympus owes its excellent all-round performance to the two-spool compressor system, powered by Bristol Siddeley and since adopted by the leading new-engine programme in Britain and the USA. Proof of Olympus reliability is given by the fact that it already has the longest recorded life of any British fighter or bomber

powerplant. And the series has been proved to have enormous development potential. The first production version delivered 11,000-lb thrust dry, while the current engine reaches 27,000-lb thrust dry (24,000 lb with fully variable reheat). Even more advanced Olympus versions are rated at 35,000 lb with reheat.

Olympus applications

The Bristol Siddeley Olympus is ideally suited to operation at transonic and supersonic speeds. The Mark 301 gives the Avro Vulcan B.2 V-bomber an all-round performance unsurpassed by any other aircraft of its type. The Olympus has also been selected for the very advanced Vickers/Raglan Electron TSR2, the RAF's next tactical support/interdiction aircraft. Other Olympus versions are under active consideration for the next generation of aerial defence--the supersonic transports.



BRISTOL SIDDELEY ENGINES LIMITED

Bristol Aero-Industries Limited, 300 International Aviation Building, Montreal 2, Telephone: University 6-4604

AIRLINE OBSERVER

► Soviet Union is still holding off any approach to the U.S. toward negotiating a bilateral air transport agreement covering a New York-Moscow route and probably will make no such move until Ansett has an airplane that will match or surpass aircraft now operated by U.S. carriers on long-haul routes. Indications are that the Tu-114 turboprop—currently Russia's favorite for long-haul intercontinental routes—is still having technical difficulties, rendering unsound gear boxes from which, from the 12,000 shipyards, the Tu-114 is to be manufactured. The chairman of Ansett, Sir Alan, The Tu-114 was scheduled to enter domestic Ansett service last fall, but is still not operational on regular-scheduled trans-Siberian service.

► Watch for early creation of an industry-wide statement committee on a national scale—probably by the end of this month. Aim is to establish usage standards for all airports. Federal Aviation Agency would be represented on the committee since it will be making the regulations in this field, but the agency would consult and cooperate with the committee. Brig. Gen. Jack R. Cross, USMC (ret.) (see p. 111) who is special consultant to the Air Transport Association on some of these matters, is organizing the committee, which will include manufacturers and other segments of the aviation industry.

► Chances are strong that the transportation industry's fight to eliminate federal transportation tax entirely may be undertaken by determination of the Budget Bureau to block the reduction of the present 10% tax to 5% scheduled to be effective June 30 under legislation enacted by Congress last year.

► Airline stocks listed on the New York Stock Exchange reacted sharply to the decline in stock prices which demonstrated market activity early last week. Of the 10 transocean carriers based on the board, 10 of six fell new 1339-63 basis as a single day. The sharp drops were attributed generally to declines which were spread throughout the list, but several brokers suggested that airline common stocks were reacting to a move by mutual funds to replace low-priority stocks with fixed-income securities (IAW Jan. 4, p. 12). Six airlines involved in the decline were American, Capital, Delta, Eastern, Northwest and Northwest.

► Breakdown in negotiations between France and Australia over the future of Paris to win operating rights into Sydney for the privately owned French carrier, Tarn, on Jan. 16. Paris-New Caledonia-Brisbane-Australia segment of France's proposed around-the-world route (IAW Jan. 9, p. 9) has forced the French to sacrifice its overseas traffic rights. Tarn, which it previously served under a previous arrangement, The carrier now heads at Durban on scheduled flights for refueling purposes only.

► Starting rate of increase in worldwide fuel depreciation is drawing concern from airline financial experts. Such costs, which most observers feel will continue to climb, are expected to eat deeply into airline revenues this year. Coupled with actuarial costs as long-term debt, the high depreciation rates are expected to devalue earnings as more new equipment is delivered throughout the year (IAW Dec. 14, p. 38).

► Convair Division of General Dynamics Corp. is studying use of boundary-layer control on the Convair 600 jet transport and has asked contractors for proposals on a number of auxiliary and for the system. First two production units are to be delivered by Nov. 1. Output of the system is to be 34 lb./ft.²/sec. It is to be used for 2 years as research and 3 years as leading.

► British Thomson Commissions, in a drastic move to recover at least some of the massive U.S. airline revenues lost since the capitalization of the British government in Fidel Castro, has worked out an arrangement with the British of Havana organization that will permit a return of one-half of the airline fare in tourist-class passengers who spend at least four days in a Havana hotel. Passengers show the hotel date since tickets when checking out are automatically refunded one-half of the fare between the U.S. and Cuba.

SHORTLINES

► Boeing Airplane Co. report Model 727 turboprop transports have carried over two million passengers since they were introduced in airline service 14 months ago. By early January, Boeing Transport Division had completed assembly of the 100th 727. There are now 80 of the aircraft in service with U.S. and foreign carriers. In 1968, 207 727s logged over 46 million air miles, more than 32,000 hr., carrying 3.95 million passengers. The total 50,000 passengers were carried from Oct. 26, 1968, to the end of that year.

► Irish Air Lines has changed its name to Irish International Airlines to more properly indicate the scope of its operations to the U.S. and 25 European cities. The name change is effective immediately.

► Lockheed Aircraft Corp., in supporting vocational schools for the Electra turboprop transport, has Eastern Air Lines the largest Electra operator, carried approximately 1.23 million passengers, nearly 1 billion passenger miles in its fleet of 40 Electras. American Airlines, second largest operator of the transoceanic with 21 aircraft and 18 in production, carried an estimated 312,000 passengers, some 547 million passenger miles during 1969. Pan American World Airways carried 3,636 passengers in one day, Dec. 27, 1968, in its fleet of three Electras in operations between San Diego, Los Angeles and San Francisco. Internationale, 121 Electra had been delivered by the end of 1969 and had flown a total of 110,000 hr. American now using the Electra include Eastern, Eastern, American, American, Pacific Southwest, American, KLM Royal Dutch Airlines, Northwest Airlines, American/ANA, Cathay Pacific Airlines, National Airlines, Braniff Airways, Western Air Lines, Trans World Airlines, Quantas, Eastern Air Lines and Trans Australia Airlines.

► Mikulas Airlines carried a total of 568,585 passengers in 1969, a gain of 23.5% over 1968. The small charter carrier logged 107,457 hr. to carry passengers during the year, an increase of 26.1%, and had a \$4.65 bill. in fares for 1969, compared with \$1.85 posted in 1968. The company operates in 21 aircraft fleet 33,313 hr. during 1969.

► William C. Wold Associates reports sales of small aircraft totalled \$18.1 million in 1968. The company sold 68 transports during the year, including Convair 580, 340 and 448, Vickers Viscount 810 and Douglas DC-6B and DC-4 transports.



WHAT WAS SINGER DOING AT FORT MONMOUTH? In this instance, Singer was working with U.S. Army Signal Corps engineers to advance the state of infrared art. At Fort Monmouth, and other laboratories of American defense, representatives of the Singer Military Products Division, are in constant—and productive—liaison. A division of The Singer Manufacturing Company, SMPD is composed of the Singer-Bridgeport, Diehl Manufacturing

Company and HRB-Singer. A comprehensive brochure describing these engineering and production facilities is yours for the asking.



SINGER MILITARY PRODUCTS DIVISION
The Singer Manufacturing Company • 100 Broadway, New York, N.Y.
SINGER-MONROVIA • SINGER-BRIDGEPORT • SINGER-DIEHL
SINGER-IRB • SINGER-IRB-SINGER
A Division of The Singer Manufacturing Company





TAC's four Hercules by their Lockheed Hercules C-130s in right "diamond" formation. Airspeed: 100-100 ft per second.



AEROBATIC pilots, all experts, make their left-to-right "boxer" (left) and "diamond" (right) formations. Below, jet engine nozzles in close to tail of the No. 3 airplane.



Aviation Week Pilot Report:

TAC Team

By Robert E. Stanfield

Sierra AFB, Texas—The Four Hercules of USAF's Tactical Air Command Air Demonstration acrobatics with a synchrotron precision and tightness that belies the size and weight of these big transports. Inaugurated Lockheed C-130 Hercules.

Their demonstration—shared in this article by Aviation Week's Robert E. Stanfield—is the size aspect of the flying formation, not only reflects the combination and teamwork of troop carrier and combat cargo crews, but effectively demonstrates the performance capabilities of the C-130 (AW May 18, 1968, p. 68).

The Hercules fly close. From takeoff in "diamond" where the airplanes grow apart at 100 ft per second to a speed of 100 ft—they ideally run through a series of formations changing orientation highlighted by a break-bank and nosedive, and concluded by a right-angled turn to horizontal.

Then, in 21 seconds, rotation into a 10 ft per second change in orientation flight from the Army's 10th Composite Sq., whose, about 85 used in northeast of Sierra, where TAC's C-130-equipped 519th Air Division runs many of its airborne missions. It's a remarkable but it's bound to give the respect of the professional pilot. The four-engine formation joins the stars in Lockheed's new color movie, "The Four Horsemen Show." Glend research at Williams AFB, now Phoenix, Ariz.

AERONAUTICAL ENGINEERING



ARROW formation shows the four C-130s in a slightly stepped up "wings." Straight line is held tight during maneuver.

Flies C-130s in Air Show Formations

Factors contributing to the performance of this demonstration include:

- The pilots. Members of the 74th Troop Carrier Sqdn., 46th Troop Carrier Wing, all are test pilots and aircraft commanders. Average flying time is about 4,000 hr. 1,300 hr in C-130. Team captain is Capt. Robert "Gus" Clancy, who flies No. 1 left wing. Capt. David Mason flies lead aircraft and Capt. James Akin holds the No. 2 position (right wing). During the day is Capt. William Herkfeld. Alternates is Capt. Hans Blumer, who flies alone during this flight.

- The crew. All team members are volunteers. Captain van, and include instructor pilots and aircraft commanders. Along on this demonstration were Capt. Robert Stank and Capt. Stewart.

Stewart, Lt. Joseph Morton and Van cut. Mason accompanied by the 77th Troop carrier Sqdn. 46th Troop Carrier Wing, and Lt. Col. Robert C. Carlson. Flight engineers included U.S. Air Force Tech. Wks. Wm. Woods, Richard Stevens, James Smith and Charles Koenig, the top is 3 digits John Lunden, James Rove and Dean Nudista.

- The airplane. Lockheed's C-130 which can operate in and out of a 2,700-ft strip does quick and precise maneuvers to control application. The airplane literally leaps ahead with instant power increase. The A model is powered by four Allison T56-A-10 turboprop engines of 4,850 shp each at takeoff.

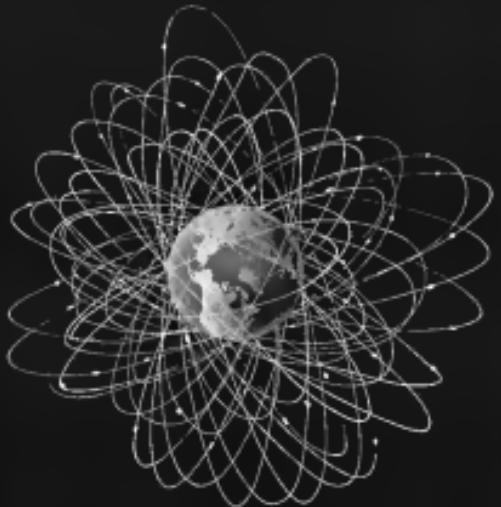
Maximum gross weight is 124,200 lb and 133,000 lb, respectively. These aircraft profile the "X" in the diamond formation, flying in a second faster to power application so that the "X" is decelerated profile runs 1,100 rpm in against 1,016 rpm for the fast blade "W" propeller, and to be more of a "cruse" propeller than a "power" propeller.

- The command. High caliber of precision flying and teamwork is standard procedure with TAC's combat flight force, in this instance the 829th Air Division, commanded by Col. Albert V. Enders, of which the 16th and 46th Troop Carrier Wings are commanded, respectively, by Col. Daniel P. Yamas and Col. George C. Nettles. These are the sole U.S. based TAC units to



SEVEN-EIGHT formation, followed by a low break to transition, finally completes the 21-sec. aerobatic demonstration.

PHASED ARRAYS



what's where in space. We soon will face the crucial problem of identifying and keeping track of hundreds of man-made objects in outer space. Phased Array Radar techniques developed at Bendix Radio, offer a solution. If many widely spaced satellites or missiles hurtled over the horizon at the same minute, a tremendously high-powered Bendix® radar directed by a computer, could acquire, identify, track and control each one without losing previously acquired targets. The Bendix Radio Phased Array Radar offers the most versatile 3-D data gathering system yet devised. It searches and tracks multiple targets simultaneously. It can provide long-range reconnaissance at the same time. If your organization deals in advanced operational concepts and weapons systems, you're invited to contact us to learn more of this latest Bendix space development.

PHASED ARRAYS

Bendix Radio Division
GOVERNMENT PRODUCTS • INTEGRATED SYSTEMS



8000 TIT (radiation added temperature). Officers would get enough to wear it, but wouldn't exceed 9700 TIT. Gliders would be at least 120 ft.

Normal torso carrier procedure calls for a 30-sec interval between launching and impact so the leader flies a foot. The four Hornets say they take a 2-sec interval, but the team moved to separate their roll as a unit. There was a bit of hasty jockeying in No. 2, though, some protracted and wasted left, then right again. All aircraft were moving fast.

The slot airplane was airborne first, getting propellist at 100 ft after about 1,500 ft. It was holding well at 1000 ft, as the other three were still at the lower 170 ft. The slot was now looping out of the leader's sweep. Landing gear were selected as pull-off. Flaps were up and the group as "pocket" "diamond" passed over the red of the runway at 1,500 ft, altitude climbing 1,000 ft at 120 ft.

Swinging around in a shallow bank, 15 deg., the four-plane element lost 10 sec in reaching 3,000 ft, while—except for the head-bump of the slot—was accomplished. Separately, the last-passed station made a vertical spin of less than 300 ft to 5,000 ft at 100 ft per sec, but the 300 ft. That day's turbulent weather suggested the low-level work.

Once leveled off, the Hornets were in radio and were close on these two long-distance passings. At this altitude, our fuel flow was 1,500 lb/hour. Using 1000 TIT was about 8000 for the first biplane. Engine was 21,000 rpm. Indicated airspeed was 270 ft/sec. Actual airspeed was 180 ft/sec. Airspeed was restricted at sea level to 180 ft/sec (180 mph).

Close Formation

The slot airplane held as close as 2 ft from the leader's tail. We could read the first three digits of its serial number, on either side of the tail, vertically. Counting the slots would be a stretch. A line extending across the wings of the lead aircraft would have run across the nose of each wing. Should either No. 2 or No. 3 have pushed forward too far, a line of three aircraft would have slipped across. Even for the leaders, they flew slightly higher.

The nose of the slot airplane (high in the frontmost—on a semi-bielliptical lead fin) was the top-most of the leader's fin—so about the top-surface of the two wings would meet. Looking ahead and down, the slot airplane appeared to resemble a large propeller plane.

At a team the Hornets only got about 6 ft as a search practice. This demonstration started their first flight together in six weeks. They first landed

up in 1957 and, when they first flew together, are possibly distinguishable only by their color—a silver hence a lead on a black background, with the Hornets wearing IV—small pitch nose, and the slot wearing V—large pitch, packed up tight against No. 3, which had lost the end of the color wash), as straight over the line. Capt. Bill Hartfield set the slot point, bristled the end of this strip.

From "away," the group moved to the "overhead." The first two aircraft held their position. No. 3 moved to the left along on No. 2's stream. No. 4 also moved up to lie in No. 2's right wake, which seemed out about 15 ft more from the cockpit.

Level Rock

Using rock to "disorient," No. 3 went quickly around forward, sliding in to the leader. No. 2 used out to the right, and as the slot airplane decelerated slightly, skidding left, then again took up the slot position. There was no wasted effort and no wasted space; the manouver was accomplished smoothly, and in a breaking.

As the aircraft pitch down, flying right and changing from a right to a left throttle position, pilot must be alert to even movement they can't watch their instruments but must constantly keep them out in the one am-

RESISTANCE TYPE TEMPERATURE DETECTORS by LEWIS

QUALIFIED

for

radio, television, electronic and

other electronic applica-

tions

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

—

place to which they are holding. The loader alone can load about. Single-place, single-engine aircraft are most responsive, it is surmising that three big four-engine turboprops can be handled like four fighters.

The toughest job of the four is that of the No. 4 cockpit pilot. Running



First Photos of Fiat G.91 Armament

First photograph of specific German stainless steel installations in Flat IRVY demonstrates removal of lightweight steel fittings (AW June 11, p 50) show one of two Swiss IRPA Type 1923 nuclear reactors which replace the standard stainless steel installation of other Swiss IRPA reactors, common in most of German, Italian, Belgian, and in familiar to NATO forces in the UK, in the Belgian and French, and by the British in the later country which uses the Hawker Siddeley. German installations use different concept from Italian, French, and UK ones. The German reactor is a two-loop system with two steam generators and an intermediate heat exchanger. The heat exchanger is a vertical tube-in-tube heat exchanger with two loops at upper left of two large plates. The heat exchanger is connected to a system of 4 parallel steam lines. (Below) measured with flux radiographic basis on removable plates crossing the heat exchanger bases. (Left) Penetralia radiographic base line photo to plant and make it possible to pull a feed-water installation and replace it with a fully charged one at a few minutes (AW June 25, 1988, p 50).

long switch a "bigtime" a nervous. I soon "cashed in" (ended right) the leader and No. 2 held them position. But Capt. "Gene" Chouteau, the commander, had to make doable an approach. Flying off the leader's lead, he never did, but right into position No. 3 position of the staggered formation. Shei cockpit, which was unusually bad (second right closed in a Goney wing as he came up. There was a bit of maneuvering before he was a fast bird). These pilots

The bush-hammer—a highly popular antelope which is now listed the "Blossom-horned"—only fits a domesticated belt on a guide's trip to the campsite from the "diamond," at which time the antelope fits his plate upon a wooden change and altitude gauge, 3,000 ft., then a fast running $\frac{1}{2}$ diamond. For private reasons, the antelope and his master are given from the antelope.

Still holding at 3,800 ft., the leaden
clouds that the formation was "real
to bust." Not until cockpit began
to count off 10 sec time with the
seconds left to go, pilot Hatfield called
the maneuver. Stand by . . . 10 sec
. . . Now!

Shot explosive shot up so fast and
dropped at a 45 deg. left. I was
sure I didn't see the others three, which
were heading up at 8,000 ftm plus
from the "diamond," the leaders
had already pulled up and 45 deg. to the
right. No 2 was 90 deg. right. No
3 was 90 deg. left. There was no power
increasing in the "box" — just a sharp
pull up and back.

Predicting Headway

At 5,930 ft., still headed up, all aircraft turned back to the gridline crossing. At 6,200 ft. leveled off, then quickly turned back into "diamond" leader at this point calling out the indicated airspeed. 230.

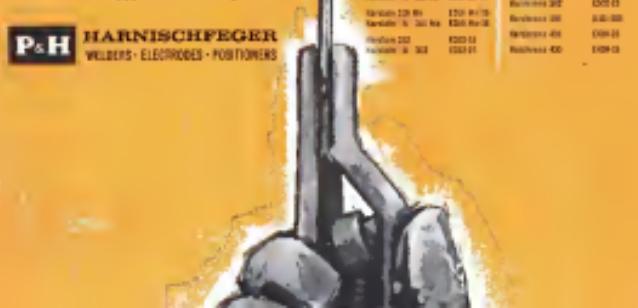
... " This was a 'beautifully calculated masterpiece' - a fast-looking, well-paced set of flying done with the precision of the professional *airman*.



P&H announces a new and complete line of STAINLESS STEEL ELECTRODES

In addition to a wider choice, Harnischtegel offers you stainless steel electrodes with exceptional weldability and quality control in all AWS-ASTM types. Improved chemistry assures stronger, smoother beads, with less spatter and easier slag removal. Write for Bulletin R-49 which gives the chemical analysis and mechanical properties of each PaBeta stainless steel electrode listed here. And tell us about any special requirements you may have. We'll be happy to work with you.

P&H HARNISCHFEGER
Wulens - Elektroden - Punktionswerk





is part of the picture on front page projects of today.

A HIGHLIGHT ON CREATIVE SYSTEMS ENGINEERING AT **Reeves**



PRECISION...ON A SPACE-HIGH PEDESTAL

Reeves has pioneered in the development of extremely high precision low- and high-speed altitude pedestals for fire control, guidance and tracking systems. Reeves-engineered pedestals and related electronic assemblies, utilizing servo systems and computers, are predominantly in types for both land-based and shipboard applications. The pedestals provide continuous rotation in azimuth, with angular travel in the remaining two axes designed to meet particular requirements. Accelerations in the order of 0.1 millidegrees can be achieved, with rates of 30 degrees per second, or higher.

REEVES INSTRUMENT CORPORATION

A Subsidiary of Dynamics Corporation of America
Research Park, Somers, New York

Qualified inquiries will be handled according
to specifications for this industry or the end
client. Let us help you get in touch with us.

Front page projects of tomorrow are part of the picture at



win on the deck, the fleet was moving toward the second trap.

There were no engine problems or malfunctions during the aerial demonstration, although the Hornets had experienced engine failure which did not disrupt the mission. The traps also did not catch out that there flying is only representative of the traps on our pilot. In our early days, they also had that their biggest losses is 4600 Wing Commander Col. George G. Morris.

The E-10A and the "B" are somewhat similar. The "B" has more flight from Soviet ABK and Fr. Compagnie, but not in an end elsewhere. Compagnie usually makes for, and the aircraft are operated in "higher" configuration (lower reheat and engine) for maximum of the time, whereas, the aircraft can be flown in a great many configurations, including the use of engine anti-pollution mode.

Operating Weights

For example, the C-10B, at an operating weight of 71,000 lb with a 22,700 lb load, has a range of 1,077 miles at 630 ft fuel residual, with one fuel cell range in 3,457 miles.

Carrying a 16,700 lb load with 2,793 lb fuel reserves, range for the "B" is 1,037 miles on, at one fuel cell range in 2,867 miles, and

At an operating weight of 70,100 lb, and carrying a 22,700 lb load with 4,280 lb fuel reserves, the C-10B has a range of 1,017 miles on, which, with one fuel cell range to 1,357 miles, and with a 16,700 lb load, at the same operating weight range is 3,860 lb fuel reserves in 3,000 miles. At 630 ft fuel reserves in 3,000 miles, the "B" fuel range extends to 2,167 miles.

The "B" will continue the "A" model for about 20 ft at a constant decelerable cruise altitude of 10,32,000 ft and 23,000 ft. Flying at the same altitude, with the same power setting, there is only a 5 ft speed difference in favor of the C-10B.

One striking characteristic of the Florida aircraft developed by Avia- tions Works is its 10% lower fuel consumption than the three aircraft, but not a lot more. It can be half-filled at 4 miles less fuel at 4 miles a second, that odd. It performs short segments without diminution of the pace and with minimum gain growth in the void area.

Reeves started long-distance negotiations to purchase 50% interest in Massachusetts, Inc. of Tiverton, R.I., manufacturers of navigation instruments, optical and mechanical timing instruments, gyroscopic and electronic motion mechanisms. Massachusetts will be granted license to manufacture individual items in Hamilton Standard's line of jet equipment.

German Weld Process To Be Marketed Here

Weslock, Conn.—North American rights in a versatile electron beam process for machining as welding hard metals have been obtained by Hawlees Standard, a division of United Aircraft Corp., according to the company.

In discussing the agreement, Charles M. Keene, general manager of Hawlees Standard, and the acquisition of the patent, was the firm's first major move outside the eastern field though the firm's focus mostly developing within the field.

The process and the equipment for it, developed by the Carl Zeiss Foundation of Oberkochen, West Germany, can be used to cut holes in, or otherwise treat, metal in sheet, sheet, or hard material including tungsten and the exotic materials, according to Hawlees Standard. The equipment, to be sold here as the Hawlees Zeta Electron beam machine, is said to have welded through standard steel as such thick as a few seconds deep, fibers.

Under terms of the agreement between the two firms, Hawlees Standard will start manufacturing the machine this year. Hawlees Standard, Inc., New York City, partly owned by United Aircraft, the Zeiss Foundation and Irving Arms of Massachusetts, N. J., will market it. Ross A. Korn, chairman and John F. Sullivan, former Hawlees Standard president, manager, has been elected president. John C. Steingel Jr. has been named project manager.

The electron beam process, which physically as claimed changes metal with a controlled high-density stream of electrons, consists of an electron gun, a vacuum chamber and worktable, a high-vacuum pumping system, an electronic control system, high-voltage power supply and associated monitoring equipment.

Hawlees Standard spokesman said that as a welding machine the equipment can be used to produce 10,000 ft-lb of torque at three times the rate of a hand tool a minute. It can be half-filled at 4 miles less fuel at 4 miles a second, that odd. It performs short segments without diminution of the pace and with minimum gain growth in the void area.

Reeves started long-distance negotiations to purchase 50% interest in Massachusetts, Inc. of Tiverton, R.I., manufacturers of navigation instruments, optical and mechanical timing instruments, gyroscopic and electronic motion mechanisms. Massachusetts will be granted license to manufacture individual items in Hawlees Standard's line of jet equipment.

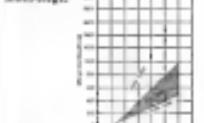


HELICAL GEARS
A multi-tooth profile of one gear, formed, turned, helical cut, ground, and polished, is shown. The helical cut is 30°. The other helical gear has a similar profile but is slightly off-set.

WHY M-D ROTARY POSITIVE BLOWERS develop higher pressures!

The unique combination of precision engineering and modern design found only in M-D rotary positive blowers permits higher speed operation and higher pressures. For this reason M-D can furnish greater air flow at lower initial cost.

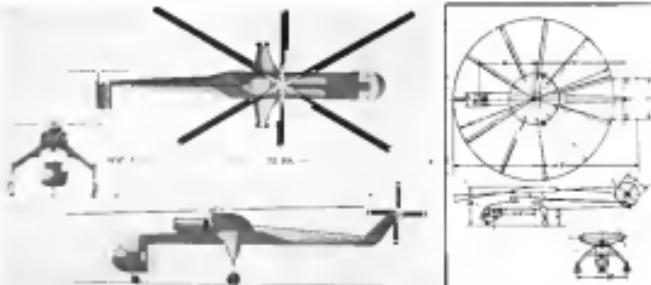
M-D blowers operate at wider pressure and speed ranges than any other rotary positive blower. Capacities of 22 production models range from 50 to 6,000 CFM, pressures to 24 PSIG single, 76 PSIG multi-stage.





Low-altitude configuration of the S-64, turbine-powered development of the piston engine Skycrane, is shown in an artist's conception. Powerplants: twin turboshaft for the General Electric T64 and the Pratt & Whitney T701. Payload is 10 tons; gear: 15.2 tons.

Sikorsky Shows S-64 Changes, Studies for Future



This view of the S-64 shows changes from earlier studies: addition of a sixth rotor blade (engines mounted on top rather than at the side of the fuselage, deeper cockpit for improved seating, T-tipped landing gear struts). Swivel seat for the pilot, by which he could be lowered for normal flight or lowered for cargo handling, has been dropped. Lowered seating for the operator provides better visibility for cargo handling.

Another configuration of the S-64 (note right main prop) has a somewhat different engine layout. Here they are mounted directly on top of the fuselage just ahead of the main rotor. The use of the



Concepts for the future (AW, Feb. 2, p. 66) include the S-57, a delta-wing cruise aircraft (AW, May 4, p. 47) with a one-blade retractable rotor. When landing gear retracts into wingtip pods, parked on the ground, left to right are an orthorotational fuselage door helicopter, a compound helicopter to carry 10-12 passengers, a dished-hub vehicle and a tilt-wing vehicle. The vehicle flying at the extreme upper right is a concept for the Katharion, only wingless, turbo-powered helicopter (AW, Aug. 27, p. 14).



Developed as a flying crane, to a gross weight of 42.5 tons to carry a ballistic missile size payload of a maximum of 21.9 tons is being studied by Sikorsky Aircraft Division of United Aircraft Corp. Latest configuration calls for main power Pratt & Whitney T701 turbine engines, podded at pure outboard of the fuselage. The 100-ft. diameter rotor is made up of 12 blades and a large, rotor hub framing to reduce drag. First full scale prototype can be seen more clearly in the three views (plus, right on the previous page).



Her master's choice

The pup's world stops just a short step outside the elegant cabin. Above the Aero Commander, surrounded by creature comforts, her master knows why he chose this luxurious business twin.

Pilot or passenger, you relax in an individual, reclining chair with deep, foam cushions, neckway arm rests and a contour back. Each chair glides fore or aft, as you wish, and so is by its own window.

There's an individual reading lamp, adjustable air vent, ashtray and lighter for each seat. The cabin floor is covered with deep pile carpeting. Walls are upholstered with rich, cushioned materials which contribute to the comfortable quiet that makes conversation relaxed and easy. The high wing stability of the Aero Commander creates an unmatched smoothness for your comfort in flight.

Step in and see for yourself why Aero Commander is the choice of executives, professionals and kings. Ask your distributor for a trial flight or write today for a descriptive brochure.



Another product of **ROCKWELL STANDARD** Corporation

AERO DESIGN & ENGINEERING CO. • BETHANY, OKLAHOMA



Design Details of Ka-18 Four-Place Helicopter



Upper main (above) turns clockwise, lower rotor (right) turns counterclockwise. Rotor blade pitch is at bottom of rotor seat. Design N. Koziev says the helicopter cruises at 100-120 km per hour (60-75 mph). Seats have claimed 300 kg load capacity around 3000 kg weight, covering two persons (AV July 25, p. 97), probably using a 275 hp engine.



MISSILE ENGINEERING



TITAN STAGE II insulation is suitable to 60 mph and withstands rugged conditions.

Part II: Titan ICBM Operation

Hardened Titan Bases Require Specialized

By Russell Hawkes

(This is the second of two articles detailing the operation of the USAF's Martin-Marietta hardened ballistic missile maintenance program developed by the Martin Co.)

DURING Calif.—Operation from hardened bases entailing requirements for extended 30-day periods understandably invited special problems of ground support for the system design team of USAF's Martin SM-65 Titan intercontinental ballistic missile.

A Titan base typically will be equipped with two missiles arranged in three-missile complexes. The three missile plots in the base will constitute a squadron. Everything is underground and protected by two or three feet of concrete including living quarters, food and all other provisions for the interval, as well as propellant storage, thermal power plant, launchers and all wiring and plumbing.

Requirements imposed by the hardened base, characteristic of the separate or separate flight against radiation contaminated manual for personnel, seven diesel generators in the power house and for cooling of electronic equipment.

Mobile launchers and ground-based guidance antennas are mounted upon elevators to raise them from their underground sites for launching operations.

Facilities account for more than a third of the rest of a complete operational base, and ground support equipment for another third. The other third

BOTH STAGES of Martin Titan are loaded

aboard a Douglas C-133 at Denver for shipment to Cape Canaveral, Fla., for flight test. C-133 accommodates the stages without modification.

Support

gives for the nine missiles and other airborne elements of the system.

In most terms, underground complexes will be built by digging out a broad pit, 16½ ft. deep, refilling it to get a level, 100-ft. deep floor. The silos themselves will be erected there, using some or less conventional surface construction methods. When these are in place, digging will be continued to other depths of the system being constructed at different depths. Davis, Mann, Johnson and Mendenhall and Associates holds the contract for operational facilities.

Titans base, Th. at Lowry AFB, Denver, the first to go on an operational footing, is scheduled to be ready in 1968. Operational Simulphib Test Facility (OSTF) and training base, T1-I at Vandenberg AFB, Calif., will be in service earlier, the former by late 1966. T1 in a single missile site, intended to provide a final test of all the operational base requirements. When completed, T1 will be next to the operational test facilities and the two areas will share the same personnel and some other support facilities. Though it will obviously be hard base design, OSTF may not actually withstand the 100 psi. blast overpressure arbitrarily set as the dividing line between hard and soft.

A big test limit on hard base construction with the tough ground support engineering problem has required the USAF system team to design bases substantially concretely without benefit of an initial series of data from conventional programs. The regressive approach of Martin's part of the Titan



TITAN STAGE I is erected in cell of 160-ft high fixture at Martin Denver for non-flying USAF acceptance tests which cover all elements of a missile, short of propellant loading.



TRANSPORTED with Titan first stage is rolled onto trailer of test stand at Martin Denver.

Space for Stafoam today!

A few months ago we published an advertisement featuring the illustration above, predicting the many uses for Stafoam urethane products in man's space stage of the future. . .



Actual photographs of previous model crafts, a later concept of interplanetary travel, and a cutaway were prepared by the Astro Systems Research Directorate, Rock Island Arsenal, Illinois.

Today, a prototype multi-capsule craft is under contract at Interpace Corporation to build a space station. It is being developed by the Astro Systems Research Directorate, Rock Island Arsenal, Illinois.

Today practical applications for Stafoam urethanes are an infinite as space itself. The successful projects listed below have proven to men of vision that there is "space for Stafoam today."

For a new dimension in material technology, contact the Product Line Manager, American Space Products Corp., or its Associate, Stafoam products requirements and/or associated interests.

STAFOAM PROS
Treated & Untreated
Aromatic Polyurethane
Foam & Coatings
Hydrazine & Urea
Polymer & Thermoset

STAFOAM FLEXIBLE
Silicone & Chloroprene (pig)
Crosslinked polyurethane
Silicone & Chloroprene
Thermoplastic polyurethane
Epoxy foam & urethane
AB & Biotite Thermoset

POLYURETHANE
Aromatic urethane polyols
Industrially & under license
Crosslinked polyurethane
Epoxy foam & urethane
Silicone & Chloroprene

POLYPOXY
Aromatic polyols
Crosslinked polyols & polyols
Crosslinked polyurethane
Epoxy urethane
Silicone polyols & urethane
Polymer & Thermoset

POYURIDAM
Crosslinked polyols
Crosslinked & under license
Crosslinked polyurethane
Epoxy foam & urethane
Silicone & Chloroprene
Polymer & Thermoset

stafoam urethane products that as well as a close approximation of the ground work of past projects. Martin-Dorex has an Advanced Space Systems Department which is on a par incrementally with the Astronautics Department which developed the original craft.

In the past year, a group has been taken from Martin-Dorex to form a corporate division of equal rank to the silk design of ground support equipment and other electronic subdivisions. Electronics Division has research and development responsibilities in such fields as design of space station, launch control and electronic components. Another new corporate division of the Martin Co. known as Atticraft Division, has been set up to play an integrating role and to ensure that these bases are activated and ready to accept production needs as they begin to come off the drawing board.

Advanced Space Systems Department at Martin-Dorex is given deep detail so far as to technical mobility to keep abreast of the latest advances in the field. Detail engineering is handled by the Electronics Division or subcontractors.

Martin holds the contract for the launch control and checklist system as well as for the module shell. The system is to provide an automatic periodic check of vibration functioning as well as to allow writing even to man tests during uncontrolled maneuvering or after an aborted launch. During the checklist sequence, vibrations or positions of three are operated, operation is measured against a standard and a "go/no-go" indication is displayed at the control located through the module. Design of all the equipment utilizes British or the equivalent module level.

Operational equipment is an major concern simpler than that used in the development program since these are requirements in earliest and earliest data. Other crews in these crafts in the control center will be able to run a complete automated brand of these are no technical holds. Operational transfers will be made by American Spacecraft & Services. Components of the standard operational brand will be designed and installed by Stafoam Corporation, except in the case of Vandenberg AFB, where the Kelling Aerospace Supply Co. will provide the necessary services network for GSTF and T-74.

Another contractor for the payload loading system is Astro D. Little Co.

The code serials program, interests, including the in-astorbite guidance instrument, is being designed by Bell Telephone Laboratories and will be produced and installed by Western Electric Co.

Big job done by the operational



Here is a man you should know

he's a **DELAVAL FUEL INJECTOR SPECIALIST**

His name is Bill D. Burgess. He's a senior project engineer on Ford's Jupiter Development, specializing in injector devices for diesel, gas-turbine and propane fuel injectors. He's been with Delavan 3 years, and has designed and developed fuel injectors for more than some of the most advanced aircraft engines, scheduled for production in the near future. Men like Bill Burgess, representing their talents in fuel injection development, have made Delavan the world's largest nozzle specialist. They're the main reason leading turbines, jet, rocket and APU manufacturers rely on Delavan for fuel injection problems.

If field testing and stimulation are part of your product, take advantage of Delavan's specialized experience and proven ability to deliver world-class quality fuel specifications in the shortest time for optimum fuel economy.

DELAVAL
Manufacturing Company
West Seneca, New York
World's largest nozzle specialist



BERYLLIUM: successful resistance weld!

This photomicrograph is visual proof that beryllium can be resistance welded. Extensive tests at the Budd Company indicate useful sheet metal products can be fabricated from beryllium. Work with beryllium at Budd includes successful hot rolling, brake forming, deep drawing, beezing, resistance welding, arc spot welding, arc welding, cleaning, machining and hot shearing.

Creating structures—thru the use of promising new metals and alloys—and making these concepts practical realities has been a Budd specialty for 30 years. Write today for further information. The Budd Company, Philadelphia 32, Pa.

SPACER/TOUGH
Budd
DIVISION

checkout and launch control actions at the launching cell. If the proper state of readiness exists, launch sequence consists of propellant loading, attitude elevation, launch cell return of the launcher to a horizontal orientation. Propellant ignition sequence is automatically initiated when a launch cell is positioned in launch control equipment and monitored by a single axis sensor. Elements of the total system to be checked in the pre-launch sequence have been strategically selected to minimize the number of checkouts necessary to give an overall measure of system performance.

Central launch sequence controls launching equipment and checkout. Operation of the flight control system, launch control equipment is typically simple. It sets the flight control system proper to the proper starting position and attitude of the launcher, and the overall system is fully operational. The system is then checked for proper attitude and launching of all the principal output signals of the flight control system. Failure of total output to match the established criteria would light a no-go signal, all subsystems would be revisited to the flight readiness condition and a more detailed checkout would be run to isolate the fault.

Functioning of the propellant loading and pressurization system, launch control equipment also is addressed. Sequence of events includes loading of propellant, pressurization, pressurizing the insulation coating of the nose cone, pressurization of the nose cone, pressurization of loaded propellant tanks, disconnect of propellant umbilicals and insulation of the propellant loading and pressurization box system if something malfunctions. Averaging supply station provides ground power to launch control subsystems.

This includes insulation as well as electrical power.

When the nozzle shield has its attitude set by external power, the sequence begins with insulation of the nozzle shield. Then, for loading of hot-dip, hot-dip and decompressing umbilicals. By gone control system, launch control equipment sequences the firing of that ring down of the booster engine, arms the mainstage engine and controls the nitrogen sharing system for the booster engine. Launch sequence is the sequence supervisor when generates commands either as a function of time or event.

Flight control system checkout begins with an overall test of the system and a self-test function, incrementally all of the flight control and control units. When a no-go signal appears, the operator must take a roll call of replaceable modules until the bad one is found. Specimen control signals for checks are



PILOT made at Bitter Creek is located about 12 sec before a T-100 firing at Cape Canaveral. Propellant loading is complete except for piping on ground to nozzle to avoid 14 gpm. load off. Trapping lines run through carburetor tubes which remain standing.

generated. In controlled movement of station arms, flight program unit is checked in running it through its planned sequence and comparing output with prescribed limits set up in the checkout equipment. Diagnostic function is used to walk through a test of test and a go/no-go signal is obtained to facilitate checkout of the flight and checkout actions. Controls for initiating the automatic checkout sequence are located on the panel board of one chassis.

Propellant Loading

Propellant loading and pressurization control checkout equipment tests ground propellant loading facilities as well as the various parts of the nozzle and propellant loading and pressurization equipment. Components of the system are: Gas and liquid control equipment to operate or monitor individually any propellant loading and pressurization tank. Propellant loading shield, a six do-overs hot stage, periphery to a wet loading cell to be insulated to meet all needs. Valves are purged and automated according to the phase of the loading cycle.

Averaging supply station checkout equipment tests ground 18 vdc, 12 vdc, electric supply ground 400 rpm electrical supply and ground insulation supply. Progress of the check is monitored through validation in the control unit. Progress of the power system is checked and monitored. The power system generates ground-to-ground power transfer currents in the avionics supply system.

Launch control equipment are tested in monitoring nozzle, avionics power and operating booster events. Structural power source also is used to capture other activation checklist equipment.

Engine control system checkout equipment performs a series of tests on engine control, control sequencing, start sequence and engine control sequencing.

Some subsystems may be automatically activated in initiation the module as a state of readiness. Control and monitoring circuits for these functions are part of the checkout equipment.

Avionics supply system, flight control system and propellant loading and pressurization station checkout equipment all have same continuous functions. Flight control system checkout requires total no-go signal current to prove that the system tests for a quick fault. Central console displays at least one status signal from each checkout subsystem.

At present the Titan component development program, prototype, operational ground support equipment is used in research and development flight operations at Cape Canaveral, Fla., and at company test stands here. It is because of this policy that Martin, unlike other contractors at Canaveral, does not use another name than a prefix. Contractors are entitled to R&D funds and cost less. However, the acquisition of the aircraft was verbally completed when the former decided to go operational. The aircraft had been built and the equipment was paid in single tree to take part in the missile development.

Where EECo timing equipment counts



ELECTRONIC ENGINEERING COMPANY'S
List of major instrumentation line contents

- **AIR FORCE MILITARY TEST CENTER**
 - Atlantic Missile Range Control Center
 - Timing, Digital Beam Control
 - One-way, External Timing Signal
 - One-way, Internal Timing Signal
 - Satellite Timing Signal System
 - One-way, External Timing Reference
 - Guidance, Missile Launching
 - Beam Control
 - One-way, External Timing and Electronic
 - Monitor and Control System
- **NAVAL AIR Warfare TEST CENTER**
 - Instrumentation Timing System Study
 - Design and Development of Sea
 - Target Timing System
 - Various Spectral Line Frequency
 - Timing Reference Signal Generators
 - Synthesizers
 - Launching Control System Design
- **AIR FORCE FLIGHT TEST CENTER**
 - Hypersonic Instrumentation
 - Timing System Study
 - Design and Development of Beam
 - Control System
 - Design, Calibration, Beam Timing and Control Unit
 - Design and Construction of Beam
 - Reconstruction and Verification
 - Beam Control System for
 - Timing System
 - Design and Development of Central
 - Beam Control System
- **NAVAL ORDNANCE TEST STATION**
 - Development of Test Vehicle
 - Launching Control System
- **ROYAL CANADIAN AIR FORCE**
 - Control Timing System for Cold
 - Link System

From the Atlantic to the Pacific whenever a missile leaves the launching pad odds are better than 3 to 1 that its instrumentation is being compensated by timing signal systems made by Electronic Engineering Company of California. In the 10 short years since it first launched a basic

Several important career opportunities are now available in EEC's engineering department. For further information, call or write Miss Perkins.



Electronic Engineering Company of California
3801 East Chapman Avenue, Santa Ana, California

progress, USAF decided to postpone on the existence of equipment installed in the aircraft. At the level of ground support equipment is the Master Operational Controller (MOC). At Cape Canaveral, it is the central control and monitoring point for all activities on a Titus pad. It carries out seven functions:

- Matrix sequencing
- Hold fire control
- Range control
- Unobstructed control
- Elevation control
- Water control
- Timing

Master sequence at the MOC automatically adds specialized ground support tasks to tasks, cut the generation steps during the countdown. The order and timing of the various checks and other pre-launch steps is programmed long before the actual test flight time is set or entered later. It checks itself during the countdown to make sure the step sequence is keeping pace with the countdown.

Subsystem Checks

It is possible for MOC to run checks to verify performance of any subsystem or embankment of subsystems before the crosswalk begins. These subsystem checks amount to a complete crosswalk sequence in itself if all components work properly and to check some of the subsystems operating parameters. If an automatic subsystem such as a turn signal or a MOC is held continuously while in a hold fire or an engine shutdown, and if a hold button is also being used, the step sequence, the master sequence can be recycled to the beginning of the sequence by a second selected switch on the sequence control panel.

Typical evaluation checkers and evaluation wording for NOG are permission and preflight return preflight checklist, permission to land, permission to land, cockpit, cockpit preflight checklist, and the flight control system preflight checklist. Permission and preflight checklist clearance gas pressure to tank, clear gas pressure to tank, are adequate for proper fuel flow and equipment operation while not exceeding safety limits. Pressure valves are located high in the preflight tank and checked in the pressurization system. A check of liquid oxygen and fuel pressure system pressure is required at least once. Pressure valves will delay ignition fuel initiation. Pressure valves are detailed in detail 5.2 sections on the console rather than through the use of gas, no go lights. Pressurized helium and nitrogen as well as fuel and liquid oxygen are supplied in the preflight heading controller and controlled rates.

The controller opens valves and

They're already recording

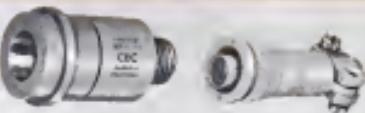
CEC'S NEWEST
STRAIN GAGE
PRESSURE
TRANSDUCERS

And here's why...

Users tell us that these small but rugged pulsejs can easily take it—even in the most severe environments. They've seen the high-performance 4320 at work in such demanding applications as rocket test stands... they've noted that the new 4-27 has the best inherent performance capabilities of any flash-oriented strain gage product available.

The 4-327 measures high frequency response and gage or absolute pressures to 5,000 psf, ranges to 10,000 psf. Both stand up to severe power low acceleration response.

A precise, reliable performer that can be close-coupled with an engine, the 4338 shows extreme stability at 1,000 g's at temperatures from -320°F. to +300°F. Its mounting insensitivity is ensured by an integral isolation pressure fitting.



or more information about the 4-386 and 4-387—*CBC's* finest achievements in strain page translators—write today for Bulletin EC 1020-X2 and 1020-X3.

Translators Division

CEC

CONSOLIDATED ELECTRODYNAMICS / Pasadena, California

WITH A VIEW TO THE FUTURE . . .



ANNOUNCES A CHANGE OF NAME

THE NEW NAME RAYCHEM, IS
DERIVED FROM RADIATION CHEMISTRY
AS THE BASIS OF THE COMPANY'S
PRODUCTS AND RESEARCH PROGRAM.



RAYCHEM
CORPORATION

MISSILE AGE HOOKUP WIRE, COAXIAL CABLE AND INSULATION FOR DIFFICULT ENVIRONMENTS

THERMOFIT.

The tubing with a memory

MANUFACTURED BY



A SUBSIDIARY OF **RAYCHEM**

OAKSIDE AT NORTHSHIRE • REDWOOD CITY • CALIFORNIA

AN ENTIRELY NEW SERIES OF HEAT-SHRINKABLE TUBING FOR BOTH PRODUCTION LINE AND FIELD WORK, PRE- OR POST-INSULATION, FEATURING FAST, EFFICIENT FABRICATION AND LONG LIFE UNDER SEVERE CONDITIONS



Wrap Thermofit on

Heat it

It shrinks

5 SECONDS



STEPS IN THE RACE TO OUTER SPACE

Atomic Pulse Rocket

This is the Atomic Pulse Rocket, a polished space ship ready the size of the Boeing Starline. It's prepared by a series of three blasts.

The one-ton rocket (weight 75,000 tons fully fueled) is designed to leave Earth with a thrust of 120,000 lbs. Altogether a thousand atomic bursts—each equal to 1,000 tons of TNT—need from a low velocity put into a heavy steel rocket engine at a rate of one per second until the vehicle leaves Earth's atmosphere. Then steam and vaporized steel maintain the thrust. After transit speed is reached, and the propulsion system

shuts off, power is provided by solar cells placed the wing and body surfaces.

Inside the rocket, living quarters are situated in the rim of a pressurized wheel-like cabin which rotates to provide artificial gravity. Radio and radio antennas resolve with it. Totalized liquid oxygen "gasoline" on either side of the fire gases ignites propane oxygen and high pressure air to produce oxygen and high pressure air.

The Atomic Pulse Rocket should be part-project to the Moon in 24 months, less than one quarter the present air time.

AMERICAN BOSCH ARMS CORPORATION

flight charges over extended distance. A similar project is just the pilot-study stage at the Defense Department.

AMRAA, now providing the inertial guidance system for the ATLAS KOMM and engaged in advanced research and development, is in the vanguard of the race to outer space. For this effort, **AMRAA** sends scientists and engineers experienced in astrophysics. **AMRAA**, Garden City, New York, is a division of American Bosch Arms Corporation.

pumps in these systems and collects data on level pressure flow rate, total flow, temperature and weight measurements. At the correct times, automatic start and stops, propellant transfer pump. Pumps that don't return until during reentry at reentry conditions. As well as performing preflight checklist functions. Right and left preflight checkers insert the selected programs of inspection commands and entries, correct operation of the program. If the flight has preflight test mode.

- Airborne hydraulic system. EL and tilted units.
- State parameter measurement.
- Pressurized test.
- Linearity test.
- Checkout of displacement and rate gyro.
- Dynamic response threshold test.
- Frequency response measurement.
- Structural feedback check.
- Flight control rate limit measurement.
- Flight control system preprogram test.
- Comparison of analog output signals with source voltage reference.

Storage Facilities

Propellant requires high pressure gas, conditioned air for insulation cooling, low density power and several kinds of electric power must be stored or generated within a reasonable distance of the launcher. Test stands at Martin-Davis have 23,000 gal vacuum-purified, non-toxic liquid oxygen tank at about 150 ft. from the firing point. Liquid oxygen can be stored in the tank for long periods of time without losing more than 140 gal per day. Two 900 gal Carter vapor pumps near the storage tanks are used for the main tank.

A variable speed pump capable of flow rates between 200 and 2000 gpm is used for fire test, fill, end and start of the ground transfer station and replacement of liquid oxygen vaporized during a hold. Main fill lines go directly from storage tank to the center liquid oxygen trapping tank to the tanking station pump. In the storage tanks via the umbilical hoses so that pressure trapping operators can continue after the storage tank has been lowered.

A dump line to carry off excess liquid oxygen in the storage tank or pump return it to the storage tank or dump it at a nearby holding point to expandate RP-1. Nitrogen gas because fuel is stored in tank 30,000 gal tank near the building. Centrifugal transfer pump can move up to 1000 gpm. If fuel trapping is low line to trapping storage pressure trapping at main tanks, all fuel fill lines are isolated via the common Centrifugal pump of the pad can be used to return fuel to the storage tanks if a holding is required.

Not to worry in the world...



THIS IS / ONE SNAP-IN CONTACT THAT WON'T PULL OUT!

...the Deutsch snap-in contact, of course—guaranteed to withstand 85 pounds pull. In Deutsch 3D automotive connectors, such pins and sockets is locked in place by an exclusive, patented spring mechanism.

WHAT'S MORE... Deutsch-designed tools whip the problem of that, reliable crimping (hand or automatic)—insertion and removal.



And...just glance at these spec's:

- Deutsch designed crimp, stronger than the wire itself. CAN 119 wire and cable.
- 7 shell sizes with chromate coating and insert arrangements.
- exclusive Deutsch bell lock coupling
- superior interfield seal
- efficient insertion, no shearing, breaking or severing
- temperature range -47° to +150° F
- and halogen electrical contact.
- interchangeable with standard GM (MS) connectors and hermetics
- were all applicable requirements of MIL-C-883C



So why worry? For details on completely reliable snap-in type connectors, contact your local Deutsch representative or write for data file 31-11.



The Deutsch Company
ELECTRONIC COMPONENTS DIVISION
Marinette Airport • Bremerton, California



Liquid Hydrogen Storage Sphere Installed

Liquid hydrogen storage sphere is installed at the new Tennessee Coal, plant being built for Lady E-1, division of United Carbide Corp. Plant will produce up to 3,000,000 cu ft of liquid hydrogen annually for National Aeronautics and Space Administration. Spheres will be shipped up to 20,000 ft for transfer to truck and railway tank cars.

be dumped and burned in a nearby holding pond.

Two storage vessels are used to provide helium and nitrogen at high pressure to the nozzle and nozzle cones of the two upper stages. A pair of the high-pressure helium tanks are located in the gas generator building. Both will withstand an external pressure of 3,000 psi and the helium compressor and nitrogen vaporizer will pressurize them to that level. Pressure is stepped down to lower levels before distribution in the nozzle, insulation layer and ground support equipment ports. Music electronics equipment is contained in one of the 25-ton air conditioning units in the test stand or conditioning unit in the test stand's exterior. Without this, failure and/or the electronics component damage the liquid hydrogen would be much higher. Checklist equipment is very much identical at MacDonnell test site and at Atlanta Meade Range, Cape Canaveral.

This was designed from the center to be reusable and air transportable

Each stage is raised on a mast-like structure with a horizontal beam bolted to Martin specifications by North American Aviation. When traveling by road, the structure is designed to support up to 50 tons. When lower, shown in the figure, the horizontal beam is 24 in. wide by 6 in. high. Two 10-ton "Towing" vehicles of 24 tons, 8 x 6 truck, "Trem" and "Trot" trailers were designed to fit within the external dimensions of a Douglas C-133 (AW No. 74, p. 19). Magna belly tires on the fine ICBM originally designed to be air transportable. Transitions for the two stages are quite similar except for the different wheel bases and slightly different nose weights designed to meet different vibration requirements. Forward end of stage one is supported in transition to a single axles, while the aft end rests on a solid support. Forward ring members are supported by a single axles and trailer supports on the transition. This arrangement isolates the stage from horizontal deflections of the transition on the road and allows length variations in the stage.

The second stage, relies on wing struts at each end so that the stage can be rotated upon the transition by actuators, checks of guidance, flight control systems, etc. Wheels of the transition are mounted upon aircraft type shock struts which can be lengthened or shortened by a hydraulic system for loading into a C-133 or in other elements of the underground when rail line transportation is used. A downward counterweight is attached to the tail to facilitate trials to reduce the hydrostatic load associated with changing the change of elevation by water can drained out of the air.

Transit cranes at Cape Canaveral and Martin test stands in Denver is a rigid frame of structural steel mounted on prints at the base to allow the center to a horizontal or vertical position.

Transit process consists of bringing the transition carrying the first stage inside the lowered center when stages are to be transported. Then the stage transition nozzles are disconnected and the shock struts are shortened and the transition is pulled out from beneath the stage. Nose slings and cables are then attached to the stage to hold it steady as the center is raised to the vertical position. One cable is run from the nozzle heat at the top of the center and attached to the forward end of the stage to keep it from slipping off in the center. When the center and outside stage have been lifted vertical, all supports except the vertical one are removed and the stage is hoisted onto the A-frame that is mounted in the same site load.

Crucet Lowered

It has been determined that the thrust cannot have unbalanced stage one the vertical support is removed and the in the crucet is lowered again to put the stage two transition for stage two is moved into the center and the center procedure is similar to that for stage one, except that the stage is lowered into the intermediate structure on top of stage one rather than onto the A-frame thrust center.

The center is raised to the vertical by a block and tackle arrangement in which a motor-driven cable system lifts a moving drum whose axle is attached to the two crucet actuator arms. An auxiliary hydraulic system holds the center in as it passes the balance point. Log loads hold the center rigid in the vertical position.

There are seven work platforms in the actuator which can be folded down to a horizontal position when the center is in the vertical position. The assembly of work platforms will be reduced to five in the operational site launcher. The engine has a pressurized elevator, a water deluge system for fire protection



EPSCO PCM

IN THE AIR NOW

The nation's first fully-operational portable digital telecaching (PCM) systems are in the air now in high-performance jet aircraft providing maximum versatility, and dependability never before known in airborne test data gathering.

In use today in the first integrated weapons systems demonstration ever to be performed using numbered analog and digital techniques, these new super-sensitive EPSCO systems time-division multiplex multi-channel analog and digital input signals, convert them to digital data, and then use a unique code for storage.

For complete technical and application data write today to —
EPSCO, Incorporated, Systems
Division, Cambridge 39, Mass.

Epsco



Plus or the necessary depth of a series of alternating cuts, drilling will insure better surface alloy steel. Though much of the information is proprietary, we believe it will be of interest to anyone in this field, including those of broad experience who may find it useful in review, fundamental facts from Delta Air Freight.

Cold-Finishing of Alloy Steel Bars: Turning and Polishing

Continuing our discussion of the cold-finishing of alloy steel bars, we take up the subject of turning and polishing. A later discussion will cover grinding and polishing. Both require removal of surface metal. In both the turning and grinding operations, adequate allowances provide for the removal of decarburization and surface defects which sometimes occur in alloy bars.

As previously stated, the outstanding advantage of cold-drawn bars over annealed bars is the bright, mirror-finish. However, the quality of the cold-drawn finish varies with the size and amount of draft (reduction of cross-sectional area) applied in cold-drawing. For example, by using a 3-in. draft, a 3-in. round would have a better cold-drawn finish than a 2-in. round.

When a superior mirror-like finish with additional accuracy is required on surfaces that are not machined (such as on shafting or machine parts), two processes other than cold-drawing are suggested: turning and polishing, and grinding and polishing. The first of these will be discussed here.

Turning and Polishing. This method of cold-finishing is generally associated with centerless bar-turners, accommodating rounds from 1/8-in. to 6-in. diam., inclusive. The process is the reverse of conventional lathe-turning, which is normally used for larger sizes. The centerless turning equipment uses two cutter heads which contain

from one to four cutting tools. The system provides for both rough and finish cuts. The bar, which is stationary, is fed horizontally into the rotary cutter heads by means of a mechanical or hydraulic feeding mechanism. Most bar-turners are equipped with a series of polishing rolls that also rotate around the bar as it feeds from the rotary cutter heads. This, combined with subsequent brushing action from the straightening rolls, imparts a high degree of polished finish to the product. A polished surface on a turned bar can also be produced by a number of passes through the straightening rolls.

This process is applicable to normalized, annealed, or heat-treated carbon and alloy bars. It does not materially affect the mechanical properties. For this reason, the end product can be machined unsymmetrally, with little or no tendency to warp.

Bethlehem metallurgists will gladly work out any problem in the cold-finishing of alloy steel bars. Always feel free to ask for their services.

When you are in need of steels remember, too, that Bethlehem manufactures the entire range of AISI standard alloy grades, as well as special analysis steels and all carbon grades.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

Export Distributors
Bethlehem Steel Export Corporation



BETHLEHEM STEEL



Bomarc B Missile Shipped by Van

Boring Bomarc B 349B interceptors missiles will be transported in mobile vans by motor truck vans. The Bomarc A missile is being delivered by an transport. Track load-out and handling fixtures are manufactured by Air Logistics Corp., Pasadena, Calif. Systems include shipping B models two in a van, both models are partially disassembled.

its first flight in 40 months. It's certain that next the debut of the ballistic missile would not be far behind. The test program of such long stops and starts. Most tests of the missile's availability and reliability are conducted at Morton's propellant research laboratory. This is a small group of separate laboratories specializing in electronic, firearms, ammunition, instrumentation, and manufacturing research and development. Most testing of components and subassemblies is conducted by the company's propellant laboratory. A special right-angle high hydrostatic test laboratory adapts missile tasks to external pressure to test their structural integrity and thermal insulation.

Data Collection

The test of the complete missile is carried out in the 160-ft high vertical test tower. Data acquisition stations of this and all other test installations are innumerable. This enormous measure the width of test models and sizes force is setting the amount of instrumentation required. Several thousand recording channels are available at the various test installations. Methods of data collection and analysis photographic methods, magnetic tape, punch cards and automatic teleprinters. Data is usually reduced for a particular task and then stored completely analyzed in computer.

There are nine cells in the vertical

"Styles change fast, so we move fast, via Delta Air Freight!"



Delta Air Freight Co. (Orlando, Florida)
Keeps abreast of my changes by supplying the latest models in a 24-hour basis

For the mobile van of the test class didn't catch us un准备, says M. C. Albrecht, Vice President Operations, "we use Delta Air Freight five days a week to meet the demand for new styles to go with them to the ever changing fast moving area, too, responding to planes sensitive to us only by Delta Air Freight."

Profit from Delta's BIG PLUS



Delta operates all cargo flights and air passenger flights on nearly all passenger flights, including: New York - Chicago • Cincinnati - Cleveland • New York - Houston - Dallas - New Orleans - Atlanta - Philadelphia - Tampa - Memphis



GPL research

Nuclear Gyros



DIGITAL — GPL achievements have spanned all areas of research and development opportunities. Only results in Potential Dividend.

GPL DIVISION

GP GENERAL PRECISION INC.
PLEASANTVILLE, NEW YORK

GPL research is now studying for the U. S. Air Force, the feasibility of harnessing the most efficient gyro known to science—the nucleus of the atom. Development of such a gyro—simultaneously accurate, perfectly balanced, friction and resistance-free—with revolutionary space references, navigation, and guidance techniques.

The nuclear gyro is just one of many progresses now underway at GPL research. Others include:

• **Self-landings as the norm:** Passive position fix landing, master amplifiers, Polarized radar sections.

- Electronically scanning radar antennas • Space velocity measuring systems • "Multi-Mode" airborne systems • Obstacle and terrain clearance radar • Advanced digital data handling techniques.

These plus continuing research in radar, sonar and data handling theory, reflect a part of the breadth of GPL's enlightened investment in the future.

Write for further information:

GPL Division, 21011 12th Avenue, Pleasantville, New York
(exterior/interior computers/magnetic tape handling systems/
communications equipment/micro-processor circuit PC).

AVIONICS

Thermoplastic Recording's Uses Studied

By Bruce Miller

New York—High-density surface recordings, comparable in size and weight to magnetic tape, may solve some soil on thermoplastic recording has been conducted by General Electric Co.

The capability of high storage densities combined with the assembly under the new recording technique (AVW Jan. 4, p. 24) is important for stable air space vehicles where weight and size are of a premium, according to George H. Miller, a project and general manager of General Electric's Defense Electronics Division.

High storage density could increase storage capacity of an airborne computer or shrink memory mass.

Instantaneous Monitoring

Instantaneous monitoring, another possible feature of thermoplastic recording, should give the technique an advantage in aerial reconnaissance. But Dr. Miller said an operator could observe sensed images immediately after they are taken and order prints when necessary.

Large, high-intensity color displays which could be projected in place of another possible application, Miller said, the technique has a host of other applications in radar and infrared detection, electronic measurement, missile guidance and communications.

A developmental model of a thermoplastic recorder and an optical system for reading black and white images recorded on thermoplastic tape were revealed here last week by General Electric.

Meanwhile, Anges Corp., a manufacturer of magnetic tape recording devices, reported it has been studying thermoplastic recording and other new recording techniques for several years.

Thermoplastic recording combines the processing speed and much of the technology of magnetic recording with the storage capacity of photographic film and hence either of these techniques to some aspects, according to Guy Stoll, Anges vice president and division manager.

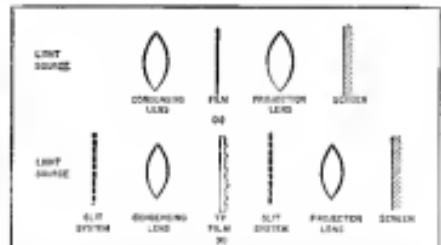
A developmental model of a thermoplastic recording machine

the processing speed and much of the technology of magnetic recording with the storage capacity of photographic film and hence either of these techniques to some aspects, according to Guy Stoll, Anges vice president and division manager.

Color Readings

In comparing thermoplastic recording with photographic, General Electric pointed out that both techniques permit reading of black and white or color information and both possess high-storage density capability. Only a black and white system was demonstrated but a color system is feasible, the firm said.

Furthermore, in contrast to photographic film, the new recording method



PROJECTOR of thermoplastic recording (top) differs from normal projector (bottom) in location of two concave lenses which a small slit allows to prevent light from reaching the screen. Diffraction patterns on the thermoplastic film, however, diffuse light through the slit and project less image on the screen.

uses these lenses, thermoplastic film can be electrically processed about instantaneously, thus shortening thermal baths and the recording can be automated simultaneously the film can be erased by heating and reused again, a cycle that can be repeated thousands of times, and laser electron imaging is possible.

Potential Advantages

Thermoplastic recording has three potential advantages over magnetic recording:

- Higher storage density, by a factor of 100 to 1. Several dozen megabits might be stored on a single square inch of thermoplastic material.
- Higher maximum recordable frequency is a factor of 10 to 1. A 30-ps writing rate is conceivable.
- Picture projection is well in electronic imaging.

General Electric declined to identify any of the three basic thermoplastic materials it is using, pointing to a number of possible materials.

Information is written by an electron beam in a three-layer medium consisting of a thermoplastic film, less than 1 mil thick, deposited over a transparent underlying film which forms the base, an ordinary plastic tape in the General Electric demonstration. Thickness of the entire thermoplastic film is several mils, a figure which the company hopes to reduce further. The thermoplastic material could be aligned to



TWO-HOUR TV show recorded on tape of thermoplastic tape is held by Dr. William E. Glass of GP behind magnetic tape necessary to record the same program.



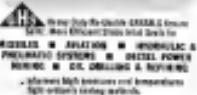
Available from Stock!
NEW, INEXPENSIVE,
LIGHTWEIGHT ORDNANCE
CRYOGENIC COUPLINGS
from FUTURECRAFT

Now you can notice a single specimen specimen with three new color types: *Dark Polyphemus*—and connect the bases, taking as many quickly, easily and safely as you like.

Write for complete details.
Futurecraft precision
machining
corporation
 1110 N. 63rd St. St. Louis, Missouri
 International Telephone: 1-5555
 7000 8th St. Seattle, Washington 98101



Exchange measured versus



www.oriental-temple.com



System Checks F-105B Axiomatics

Electrostatic equipment, designed for the Republic R-1050 aircraft, provides control checks of the aircraft's avionic gear including communications, navigation and IFF systems. The system can be mounted in areas as large as two cubic meters and still provide a program of tests on up to seven aircraft. Calibration of a transponder system in the plane's radome permits the shortest program. Adjustment of the sensitivity of the system by the status of the aircraft is performed by means of verbal or teletype signals. The 1,200 W. set has a stabilized power source and can be adapted to aircraft characteristics.

glue or seal for plate or draw out

In the plating process, film is drawn off a rotating reel and passed under a fast electrolytic bath which is modulated by the information to be recorded. Charges are deposited on the film which subsequently passes over RI photoresist to accomplish development of inferior

that only the thermoplastic film while the higher melting point substrate remains solid. Electrostatic forces between the charge portions on the film and the ground plane deform the thermoplastic causing this temperature liquid state. After the film passes the electrodes it hardens and preserves the deformation as an emboss.

Death and Separation

Amplitude and frequency of the applied signal determine the depth and the spacing, respectively, between deformations. The complete process—charging of the film, its passing from the solid into the liquid state, the deformation of the film by electrolyte fingers and



Two machines can do twice the work of one. However, With most analog recorders you can only record 36 minutes of 1000 Hz data on a 14-inch roll of 2-track tape. The new Ampex FR 600 will record 60 minutes. More data, more real! The reason: greater bandwidth at a given speed. It's at 30 ips for instance. The benefits of this are worth considering. Most data rates these days average out at 30 minutes or more. With conventional equipment that means you need a stand by recorder to play at while the first recorder is recording. The new Ampex FR 600 will record 60 minutes of 1000 Hz data at 30 ips. The only problem is that it's a little more expensive.

It's All expensive. Sometimes just for a few extra minutes of recording time. The FR400 is efficient at this by discarding the recording time for any blank tracks. It basically does the work of two conventional machines. You get the extra-wide bandwidth of 3000 Hz at 80 ips or less. None for external applications. And every FR400 tape is machine-to-machine compatible without lifting a toe. Good reasons why the FR400 is the most reliable and versatile recorder you can use. A word from the wise: the full story.

This instrumentation recorder can do the work of two



FR 600

AMPERE



New Concept In Power Conversion For Jet Aircraft

MAIN ENGINE STARTING AND CONSTANT SPEED
ELECTRICAL POWER IN A SINGLE PACKAGE

THE AIRESEARCH CONSTANT SPEED DRIVE STARTER

In a combined generator, constant speed generator, drive and pneumatic starter which will provide the low powered aircraft with main engine starting and full electrical power both on the ground and in flight.

Advantages over:

L. Conventional engine with pneumatic starting and electrical power. Utilizes starter turbine which is normally considered as

low-light "dead weight" for constant speed runs.

2. Provides full electrical power in ground without operating main engine by using a source of compressed air.

3. Provides full electrical power in flight with a minimum of bleed air for speed maintenance. Full electrical power can be maintained on an auxiliary engine or auxiliary bleeding air from operating engine.

4. The work can be made self-contained on the ground or in the air by tailoring an AiResearch gas turbine to the aircraft. This closed system within the aircraft fulfills

the three conditions listed above.

Other Features: Extremely light weight....low oil heat capacity....self-contained, self-enclosing, interesting system....high temperature operation....no bleed air required....output just over 600 KVA....up to 120 KVA.

A high degree of dependability has been achieved by using a variable gear train and control system similar to that employed in production aircraft turbines and aircraft engines built by AiResearch which have accumulated thousands of hours of successful operation.

Two engines are needed.



AiResearch Manufacturing Divisions

Los Angeles, California • Phoenix, Arizona

Systems, Packages and Components for AIRCRAFT, MISSILE, ELECTRONIC, MOBILE AND INDUSTRIAL APPLICATIONS

ing it. Service begins then awaiting the film out.

A reading or projection system for the atmospheric scanning device has a standard projection system so that the frame has a conjugate slit system. Normally, without the slit system, a light source is imaged by a condensing lens through a transparent cover onto a projector lens which then magnifies the image of the slit system. The atmospheric projector, however, consists of a slit source, which alternately passes and blocks light, a condensing lens, the atmospheric film, another slit system, a projection lens and the screen.

The slit system is conjugate so that in the absence of the projector lens, deformation light passing through the lens to the screen is focused on a conjugate of the slit system, which effectively prevents light from reaching the screen.

Difference Grating

When the deformations in the film are in the form of a diffraction grating, the grating scatters light through the lens to the second slit system and is brought to a focus on the screen by the projection lens in a position corresponding to the position of the grating.

Projections are for color and black and white film so that the slit system of the latter is omitted.

An electron gun for laying down the necessary diffraction patterns for color reading has been developed at General Electric.

Read accelerating potential for the gun is 10 kV.

Screen Split

The electron beam is split into two and both when accelerated and expanded are focused by a pentode and focused into two light sources. A diffraction grating for each picture is then formed by this split beam.

According to Dr. William E. Glavin, who is involved with the atmospheric scanning development branch here, the material has been inspected periodically for the purpose of the project. This has been done by the use of the film housed at AiResearch facilities using the serial magnification. While the two ends adjacent areas measure only in the reverse direction of the original magnification, the reading can be detected by finding rotation of the electron wave amplitudes.

AirResearch has an extensive program to explore methods of expanding beam widths and shifting density and location across bands of magnetic field, as well as to investigate electron beam, electron polarization, and photographic recording and microscopy, according to Dr. Stephen A. Fitch, an AiResearch engineer, writing in a special company report issued last fall.

Electron beam techniques appear to be promising for high resolution recording. AiResearch has a system planned with magnetic materials, ferro-electricity to permit high resolution, but also make direct voltage readout of plastic film in an electron beam are



Goodyear Cures B-52 Radome Coverings

Back of afterburner lights is used by Goodyear Aircraft Corp. to provide radome, glass and reinforced plastic film for Boeing B-52 jet bomber radomes. Glass cloth and resin layer is coated by the lights prior to assembly with boron-coated structures.

detected optically in a number of ways.

One of these uses on the ability of distorted plastic to affect the plane of polarization of polarized light. Distortion thus would a non-distorted plastic.

Shuttering Surface

Shuttering losses resulting on opaque materials is also feasible. After read, by broadening its surface after the material has been inspected perpendicular to the plane of the film. This has been done by the use of the film housed at AiResearch facilities using the serial magnification. While the two ends adjacent areas measure only in the reverse direction of the original magnification, the reading can be detected by finding rotation of the electron wave amplitudes.

Ultra-electric recording processes to an excellent very high frequency technique because it finds itself to electron beam techniques and doesn't require a large area per pixel, says Dr. Alan L. Anderson, AiResearch engineer, writing in a special company report issued last fall.

Electron beam techniques appear to be promising for high resolution recording. AiResearch has a system planned with magnetic materials, ferro-electricity to permit high resolution, but also make direct voltage readout of plastic film in an electron beam are

Radio-Telephone Link May Be Expanded

Washington—Expansion of public as ground radio-telephone service for airline passengers and general aviation to provide coverage along the "golden triangle" through new ground stations at Newark, Washington and Pittsburgh, will be authorized by the Federal Communications Commission during meeting early this month.

Authorizing expansion of the service should permit expanded coverage for passengers aboard aircraft equipped with 400 ft. two-way radio-telephone sets and flying along the major air routes of the golden triangle to pick up a telephone handset aboard the airplane and place or remove a call to or from about 100 spots on the earth in less than one minute (AW Jan. 12, 1952, p. 90).

The service, which has been in trial use in the Chicago and Detroit areas is approximately 100 percent present in the major cities, popular with business and airline passengers. Commercial aircraft operating with Northwest Air Lines passengers flying in several radio-telephone-equipped aircraft.

The Canadian Bell Telephone Co. reportedly is considering establishing

Republic

High-Performance Titanium

for the X-15



FIRST POWERED FLIGHT of the North American X-15 occurs via September 21, 1959, over Edwards AFB. Carrying a full load of fuel (pure liquid fluorine/liquid nitrogen tetroxide) the X-15 flew under power for 3.5 minutes at speeds in excess of Mach 2.

In a number of highly stressed components subject to extreme high and low temperature fluctuations, high-performance titanium in the X-15 Research Vehicle will help take man higher and faster than he has ever been before.

Republic Steel—a leading supplier of titanium, and the nation's largest producer of stainless and alloy steels—is supplying North American Aviation with Type 110A titanium for internal structures on the X-15 project.

Let us help you utilize high-performance metals to increase strength, resist heat, or trim weight. Write Republic Steel, Dept. AW-8594, 1441 Republic Building, Cleveland 1, Ohio.

Please indicate if you would like a titanium metallurgist to call.



REPUBLIC'S STAINLESS STEEL is used in landing gear of the Convair B-58. It is used in aircraft and missile structures, including the nose and vertical stabilizer. Having the ability to withstand extreme temperatures, the use of Republic stainless steel increases strength and heat resistance, prevents abrasion, lighter grades 201 and 202 are readily formed into desired shapes by cold drawing, drawing, and bending operations.

REPUBLIC'S NEW HIGH STRENGTH POWDER, TYPE RS6440
is ideal for drawings of highly stressed components. It has a tensile strength of 40,000 psi at 4.6 degrees at 1000° F. (1000 psi after heat treatment) and an 8000 psi ultimate from the size of 0.060 diameter to 0.010 inches up to and including 15 wire or barstock. Can be used with existing drawing equipment.

REPUBLIC VACUUM-METAL ALLOYS have maximum tensile strength levels of 270,000 to 300,000 psi and are produced in three thousand pound lots for missiles such as the Minuteman. Vacuums are primary metallurgy originated and smaller particle dimensions facilitate use reduced to number one size. Unusually ductility of high strength levels is also greatly improved.



REPUBLIC STEEL Where Steels are

Made to Meet the Challenge of Acceleration



How satellites can give us low cost emergency telephone service



Beyond their immediate military necessity, our newest rocket and missile programs promise many vital protections to us all...

With just the driving force of a single atom, we can build a low-cost emergency communications system to relay telephone calls around the world.

Your call would be turned to a satellite, then brouched back to a receiving station on Earth. Cost is estimated at a fraction of what would be spent to install and maintain cables or radio relay towers.

While satellite telephone service is still in the future, this—the system that can just as easily be used for communications between the Americas, or the D.C.-jettisons. This has been successful in orbits less than 90% of an earth. It is key to our success in the "Conqueror" Stage and Interorbital. The first test was recovered at 8000 miles.

Take in another product of the imagination and experience gained by Douglas in 50 years of rocket development.

Launched by the Douglas built Thor D-1500, satellite links would relay telephone messages anywhere in the world without costly cables or towers.



DOUGLAS
MISSILE AND SPACE SYSTEMS
MILITARY AIRCRAFT • D.C. JETTISONERS
TRANSPORT AIRCRAFT • AIRLINES
SHUTTLE SUPPORT EQUIPMENT

assigned radio-telephone service along portions of all of the major Canadian rivers. Greater Vancouver, B.C. and the Fraser Corp. also plan to be applying for an application to FCC for authorizations to operate such a service along the West Coast of the U.S.

American Telephone & Telegraph Co., which operates the systems at Chicago and Detroit, says it hopes to have systems in Newark, Washington and Pittsburgh in operation by spring.

At least three companies are expected to offer an automatic telephone system, similar to the Bell system, designed for urban and general areas: airtel-AC, Spark Plug, Danstar of General Motors, Brooks Radio and Motorola. AC, Spark Plug supplied most of the airborne equipment used in the Chicago-Detroit evaluation test.

The FCC turned down AT&T's request for a new frequency allocation of two unassigned authorized channels for public and general radio telephone service. AT&T had asked for allocation of 145-1451 and 149-1496 MHz.

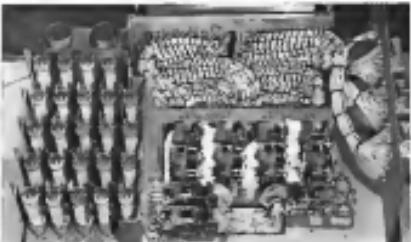
Instead, the FCC granted that the assigned service operate at the 410-4145.0 MHz and 414-4148.0 MHz bands, sharing them with the public mobile radio telephone to which they already are allocated. FCC acknowledged the possibility of interference between the two services operating in the same band. The agency said, however, that it believes that specific frequency assignments for each type of service must be arranged for the maximum range of interference.

The FCC indicated that the decision to deny the request for separate unassigned radio-telephone frequency allocation was based on the conclusion as to how widely the service would be used. The agency pointed out that the rendered living time of an aircraft and the low-cost mobile facilities available at airports indicated that the service would not be used heavily or be utilized.

The AT&T request to the Federal Communications Commission was supported by petition filed by Aerovox Radio, Inc., (Motorola) in behalf of the airtel, AC, Spark Plug and Motorola. The request also received support from the National Business Aviation Assn. and the National Assn. of State Aviation Officials.

CBS Electronics, Philips Sign Cross-Licensing Pact

CBS Electronics and Philips Corp. have entered into a cross-licensing agreement under which each firm at least the other to make, use and sell transistors and diodes or transistors. CBS has ordered machinery to begin production lines for manufacture of Philips precision etched resistors.



NOW! Automatically Control and Test Complex Electra-Mechanical Systems with complete reliability!

If you're having trouble testing complex electro-mechanical systems, it will pay you to investigate 250/254 Electra-Mechanical Systems Analyzer. It is specially designed to control and test integrated devices and their associated wiring by simulating controlling assemblies and monitoring their action. Each of the Analyzer's 250 test positions can perform up to 34 independent switching functions. In rapidly to control complex systems, therefore, is almost unlimited. In each test position the 250/254 will:

1. Activate all necessary restraining devices and provide limit-switch-to-inhibit circuitry for each device for continuity and discontinuity.
2. Simulate conditions which allow it to operate and test each sensitive device in the event order line.
3. Provide for visual measurement of resistive values and time delay constants where desired.
4. Provide switching capabilities which enable monitoring of status over circuits with external detecting devices.

These capabilities make it possible to achieve extremely high standards with complex relay chains and similar systems, thus eliminating borderline errors which can limit the performance under operating conditions. The 250/254 uses DIT-MCO's exclusive Metric Chart to put complete circuit information right in front of the operator's eyes. The switch is easy to operate, even by a fingertip, easy to adjust to any test. Write today for full details.

DIT MCO

ELectRONICS DIVISION

Box 64 17-81 Broadway
New York, N.Y. 10007
Telephone: 233-1000
In the New York area: 233-1000
233-1001
233-1002
233-1003
233-1004
233-1005
233-1006
233-1007
233-1008
233-1009
233-1010
233-1011
233-1012
233-1013
233-1014
233-1015
233-1016
233-1017
233-1018
233-1019
233-1020
233-1021
233-1022
233-1023
233-1024
233-1025
233-1026
233-1027
233-1028
233-1029
233-1030
233-1031
233-1032
233-1033
233-1034
233-1035
233-1036
233-1037
233-1038
233-1039
233-1040
233-1041
233-1042
233-1043
233-1044
233-1045
233-1046
233-1047
233-1048
233-1049
233-1050
233-1051
233-1052
233-1053
233-1054
233-1055
233-1056
233-1057
233-1058
233-1059
233-1060
233-1061
233-1062
233-1063
233-1064
233-1065
233-1066
233-1067
233-1068
233-1069
233-1070
233-1071
233-1072
233-1073
233-1074
233-1075
233-1076
233-1077
233-1078
233-1079
233-1080
233-1081
233-1082
233-1083
233-1084
233-1085
233-1086
233-1087
233-1088
233-1089
233-1090
233-1091
233-1092
233-1093
233-1094
233-1095
233-1096
233-1097
233-1098
233-1099
233-1100
233-1101
233-1102
233-1103
233-1104
233-1105
233-1106
233-1107
233-1108
233-1109
233-1110
233-1111
233-1112
233-1113
233-1114
233-1115
233-1116
233-1117
233-1118
233-1119
233-1120
233-1121
233-1122
233-1123
233-1124
233-1125
233-1126
233-1127
233-1128
233-1129
233-1130
233-1131
233-1132
233-1133
233-1134
233-1135
233-1136
233-1137
233-1138
233-1139
233-1140
233-1141
233-1142
233-1143
233-1144
233-1145
233-1146
233-1147
233-1148
233-1149
233-1150
233-1151
233-1152
233-1153
233-1154
233-1155
233-1156
233-1157
233-1158
233-1159
233-1160
233-1161
233-1162
233-1163
233-1164
233-1165
233-1166
233-1167
233-1168
233-1169
233-1170
233-1171
233-1172
233-1173
233-1174
233-1175
233-1176
233-1177
233-1178
233-1179
233-1180
233-1181
233-1182
233-1183
233-1184
233-1185
233-1186
233-1187
233-1188
233-1189
233-1190
233-1191
233-1192
233-1193
233-1194
233-1195
233-1196
233-1197
233-1198
233-1199
233-1200
233-1201
233-1202
233-1203
233-1204
233-1205
233-1206
233-1207
233-1208
233-1209
233-1210
233-1211
233-1212
233-1213
233-1214
233-1215
233-1216
233-1217
233-1218
233-1219
233-1220
233-1221
233-1222
233-1223
233-1224
233-1225
233-1226
233-1227
233-1228
233-1229
233-1230
233-1231
233-1232
233-1233
233-1234
233-1235
233-1236
233-1237
233-1238
233-1239
233-1240
233-1241
233-1242
233-1243
233-1244
233-1245
233-1246
233-1247
233-1248
233-1249
233-1250
233-1251
233-1252
233-1253
233-1254
233-1255
233-1256
233-1257
233-1258
233-1259
233-1260
233-1261
233-1262
233-1263
233-1264
233-1265
233-1266
233-1267
233-1268
233-1269
233-1270
233-1271
233-1272
233-1273
233-1274
233-1275
233-1276
233-1277
233-1278
233-1279
233-1280
233-1281
233-1282
233-1283
233-1284
233-1285
233-1286
233-1287
233-1288
233-1289
233-1290
233-1291
233-1292
233-1293
233-1294
233-1295
233-1296
233-1297
233-1298
233-1299
233-1300
233-1301
233-1302
233-1303
233-1304
233-1305
233-1306
233-1307
233-1308
233-1309
233-1310
233-1311
233-1312
233-1313
233-1314
233-1315
233-1316
233-1317
233-1318
233-1319
233-1320
233-1321
233-1322
233-1323
233-1324
233-1325
233-1326
233-1327
233-1328
233-1329
233-1330
233-1331
233-1332
233-1333
233-1334
233-1335
233-1336
233-1337
233-1338
233-1339
233-1340
233-1341
233-1342
233-1343
233-1344
233-1345
233-1346
233-1347
233-1348
233-1349
233-1350
233-1351
233-1352
233-1353
233-1354
233-1355
233-1356
233-1357
233-1358
233-1359
233-1360
233-1361
233-1362
233-1363
233-1364
233-1365
233-1366
233-1367
233-1368
233-1369
233-1370
233-1371
233-1372
233-1373
233-1374
233-1375
233-1376
233-1377
233-1378
233-1379
233-1380
233-1381
233-1382
233-1383
233-1384
233-1385
233-1386
233-1387
233-1388
233-1389
233-1390
233-1391
233-1392
233-1393
233-1394
233-1395
233-1396
233-1397
233-1398
233-1399
233-1400
233-1401
233-1402
233-1403
233-1404
233-1405
233-1406
233-1407
233-1408
233-1409
233-1410
233-1411
233-1412
233-1413
233-1414
233-1415
233-1416
233-1417
233-1418
233-1419
233-1420
233-1421
233-1422
233-1423
233-1424
233-1425
233-1426
233-1427
233-1428
233-1429
233-1430
233-1431
233-1432
233-1433
233-1434
233-1435
233-1436
233-1437
233-1438
233-1439
233-1440
233-1441
233-1442
233-1443
233-1444
233-1445
233-1446
233-1447
233-1448
233-1449
233-1450
233-1451
233-1452
233-1453
233-1454
233-1455
233-1456
233-1457
233-1458
233-1459
233-1460
233-1461
233-1462
233-1463
233-1464
233-1465
233-1466
233-1467
233-1468
233-1469
233-1470
233-1471
233-1472
233-1473
233-1474
233-1475
233-1476
233-1477
233-1478
233-1479
233-1480
233-1481
233-1482
233-1483
233-1484
233-1485
233-1486
233-1487
233-1488
233-1489
233-1490
233-1491
233-1492
233-1493
233-1494
233-1495
233-1496
233-1497
233-1498
233-1499
233-1500
233-1501
233-1502
233-1503
233-1504
233-1505
233-1506
233-1507
233-1508
233-1509
233-1510
233-1511
233-1512
233-1513
233-1514
233-1515
233-1516
233-1517
233-1518
233-1519
233-1520
233-1521
233-1522
233-1523
233-1524
233-1525
233-1526
233-1527
233-1528
233-1529
233-1530
233-1531
233-1532
233-1533
233-1534
233-1535
233-1536
233-1537
233-1538
233-1539
233-1540
233-1541
233-1542
233-1543
233-1544
233-1545
233-1546
233-1547
233-1548
233-1549
233-1550
233-1551
233-1552
233-1553
233-1554
233-1555
233-1556
233-1557
233-1558
233-1559
233-1560
233-1561
233-1562
233-1563
233-1564
233-1565
233-1566
233-1567
233-1568
233-1569
233-1570
233-1571
233-1572
233-1573
233-1574
233-1575
233-1576
233-1577
233-1578
233-1579
233-1580
233-1581
233-1582
233-1583
233-1584
233-1585
233-1586
233-1587
233-1588
233-1589
233-1590
233-1591
233-1592
233-1593
233-1594
233-1595
233-1596
233-1597
233-1598
233-1599
233-1600
233-1601
233-1602
233-1603
233-1604
233-1605
233-1606
233-1607
233-1608
233-1609
233-1610
233-1611
233-1612
233-1613
233-1614
233-1615
233-1616
233-1617
233-1618
233-1619
233-1620
233-1621
233-1622
233-1623
233-1624
233-1625
233-1626
233-1627
233-1628
233-1629
233-1630
233-1631
233-1632
233-1633
233-1634
233-1635
233-1636
233-1637
233-1638
233-1639
233-1640
233-1641
233-1642
233-1643
233-1644
233-1645
233-1646
233-1647
233-1648
233-1649
233-1650
233-1651
233-1652
233-1653
233-1654
233-1655
233-1656
233-1657
233-1658
233-1659
233-1660
233-1661
233-1662
233-1663
233-1664
233-1665
233-1666
233-1667
233-1668
233-1669
233-1670
233-1671
233-1672
233-1673
233-1674
233-1675
233-1676
233-1677
233-1678
233-1679
233-1680
233-1681
233-1682
233-1683
233-1684
233-1685
233-1686
233-1687
233-1688
233-1689
233-1690
233-1691
233-1692
233-1693
233-1694
233-1695
233-1696
233-1697
233-1698
233-1699
233-1700
233-1701
233-1702
233-1703
233-1704
233-1705
233-1706
233-1707
233-1708
233-1709
233-1710
233-1711
233-1712
233-1713
233-1714
233-1715
233-1716
233-1717
233-1718
233-1719
233-1720
233-1721
233-1722
233-1723
233-1724
233-1725
233-1726
233-1727
233-1728
233-1729
233-1730
233-1731
233-1732
233-1733
233-1734
233-1735
233-1736
233-1737
233-1738
233-1739
233-1740
233-1741
233-1742
233-1743
233-1744
233-1745
233-1746
233-1747
233-1748
233-1749
233-1750
233-1751
233-1752
233-1753
233-1754
233-1755
233-1756
233-1757
233-1758
233-1759
233-1760
233-1761
233-1762
233-1763
233-1764
233-1765
233-1766
233-1767
233-1768
233-1769
233-1770
233-1771
233-1772
233-1773
233-1774
233-1775
233-1776
233-1777
233-1778
233-1779
233-1780
233-1781
233-1782
233-1783
233-1784
233-1785
233-1786
233-1787
233-1788
233-1789
233-1790
233-1791
233-1792
233-1793
233-1794
233-1795
233-1796
233-1797
233-1798
233-1799
233-1800
233-1801
233-1802
233-1803
233-1804
233-1805
233-1806
233-1807
233-1808
233-1809
233-1810
233-1811
233-1812
233-1813
233-1814
233-1815
233-1816
233-1817
233-1818
233-1819
233-1820
233-1821
233-1822
233-1823
233-1824
233-1825
233-1826
233-1827
233-1828
233-1829
233-1830
233-1831
233-1832
233-1833
233-1834
233-1835
233-1836
233-1837
233-1838
233-1839
233-1840
233-1841
233-1842
233-1843
233-1844
233-1845
233-1846
233-1847
233-1848
233-1849
233-1850
233-1851
233-1852
233-1853
233-1854
233-1855
233-1856
233-1857
233-1858
233-1859
233-1860
233-1861
233-1862
233-1863
233-1864
233-1865
233-1866
233-1867
233-1868
233-1869
233-1870
233-1871
233-1872
233-1873
233-1874
233-1875
233-1876
233-1877
233-1878
233-1879
233-1880
233-1881
233-1882
233-1883
233-1884
233-1885
233-1886
233-1887
233-1888
233-1889
233-1890
233-1891
233-1892
233-1893
233-1894
233-1895
233-1896
233-1897
233-1898
233-1899
233-1900
233-1901
233-1902
233-1903
233-1904
233-1905
233-1906
233-1907
233-1908
233-1909
233-1910
233-1911
233-1912
233-1913
233-1914
233-1915
233-1916
233-1917
233-1918
233-1919
233-1920
233-1921
233-1922
233-1923
233-1924
233-1925
233-1926
233-1927
233-1928
233-1929
233-1930
233-1931
233-1932
233-1933
233-1934
233-1935
233-1936
233-1937
233-1938
233-1939
233-1940
233-1941
233-1942
233-1943
233-1944
233-1945
233-1946
233-1947
233-1948
233-1949
233-1950
233-1951
233-1952
233-1953
233-1954
233-1955
233-1956
233-1957
233-1958
233-1959
233-1960
233-1961
233-1962
233-1963
233-1964
233-1965
233-1966
233-1967
233-1968
233-1969
233-1970
233-1971
233-1972
233-1973
233-1974
233-1975
233-1976
233-1977
233-1978
233-1979
233-1980
233-1981
233-1982
233-1983
233-1984
233-1985
233-1986
233-1987
233-1988
233-1989
233-1990
233-1991
233-1992
233-1993
233-1994
233-1995
233-1996
233-1997
233-1998
233-1999
233-2000
233-2001
233-2002
233-2003
233-2004
233-2005
233-2006
233-2007
233-2008
233-2009
233-2010
233-2011
233-2012
233-2013
233-2014
233-

All-new concept in Classified Area Protection



Guard posts take field over-head; guards can't be everywhere at once!

Honeywell's protective system cuts over-head, guards every square foot every moment!

New Honeywell system makes possible eight, sound and movement surveillance of an entire facility from one central location!



Grease protection for far less money

Here is a complete new concept in protective systems—a system that will not pay for itself within a year by eliminating costly guard posts, but go right on adding to your profits for years.

For example, for every 40-foot guard post that you eliminate through this Honeywell system, you can save up to \$20,000. In the areas where more costs are eliminated, the savings per year is even greater.

With this new Honeywell system, a single security guard at 40-foot intervals can check instantly the security of any building or area—even remote gates 20 miles or more distant. It protects your property against intrusions by all three means of detection: 1. Physical—the visual monitoring of areas caused by the infrared 2. Motion—detection of movement of vapors that only have been emitted from within the plant.

Complete protection requires checks and balances

Devised with your security team, a Honeywell supervisory alarm system can detect any form of illegal entry, harboring, vandalism or sabotage. In many cases, a number of guard posts can be eliminated permanently. However, a security system should hardly be reliable without personnel to oversee the program—and the Honeywell system is designed to complement management, thus permitting a greater

degree of security without increasing your security force. Key to the Honeywell system is the central control panel. All of the various sensing devices report here and all communications are received here under one master unit. All intrusions are detected, no matter what the distance or signal type, as location indicated here. Detection of fire is reported here and various critical areas. Functions of the building can be monitored here—including complete surveillance of temperature, refrigeration, lights, locks, flow

Honeywell service assures maximum savings

Honeywell service adds to your savings—because it maintains for more than ready access to one of our 112 branch offices. It includes field engineering help in planning your system, as well as to service, maintenance and a really dependable maintenance contract.

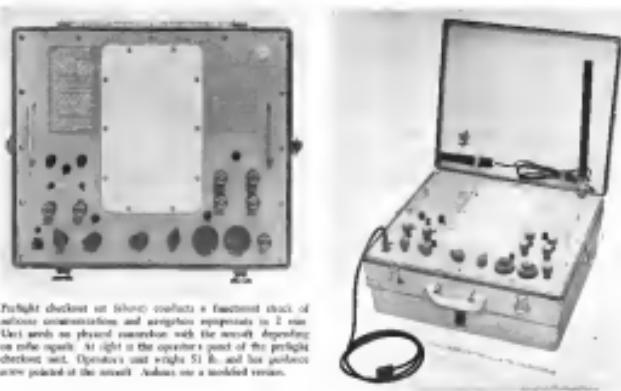
For a free survey of your facilities, call your nearest Honeywell office or write: Minneapolis-Honeywell, Department AM-113, Minneapolis 6, Minnesota.

SUIT THE SYSTEM TO YOUR NEEDS



Honeywell

H *Fit in Color!*



Flight checklist unit (FCU) conducts a functional check of aircraft communications and navigation equipment in 2 min. Unit sends an alarm message with the aircraft depending on radio equipment. At right is the operator's panel of the flight checklist unit. Operator unit weighs 51 lb. and has portable auto-pilot of the aircraft. Airlines use a modified version.

Remote Set Tests A3J Systems by Radio

By Wilton S. Reid

Small, portable battery-operated test set which can make a functional check of an airplane's communications, navigation and identification equipment without the need for direct connection to the aircraft or its avionics equipment has been developed by the Technical Products Division of Packard-Bell Electronics Corp.

Although tailored specifically for the A3 Vigilante under contract to the Columbia Division of North American Aviation, the set can be used on virtually every military aircraft. Modified versions are now in use by commercial airlines.

Proflight Checklist

Designed solely for proflight checklist, the test set is not intended to isolate malfunctions within a particular piece of equipment but to provide a positive indication that thoroughly check-started aircraft can go into flight as soon as possible.

Direct connection between test set and aircraft is unnecessary because the test set transmits its test signals by radio frequency transmission. Signals generated by the set are directional and short range (about 50 ft.) to minimize interference with other nearby aircraft or ground equipment.

Richard-Bell Senior Project Engineer

30 ft in front of the aircraft and about 30 deg. off the centerline. Aiming on the test set panel is pointed in the direction of the aircraft. Test set operates through the UHF radio frequency band in which radio signals and voice communications are established with an operator in the cockpit of the aircraft. After allowing 20 sec. for equipment warming, a predetermined sequence of checks is conducted. Operation in the cockpit was evaluated by doing equipment operation with the test equipment operator through UHF voice channel or by use of hand signals.

Directional Signals

Signals transmitted by the portable unit are directional in the sense that beam width is from 80 to 100 deg. and is shifted 15 deg. up from the horizontal. Shielding the antenna in this manner provides interference with other aircraft and also protects equipment from ground frequency and other electronic noise. As a further protection, the antenna is mounted on a rotating carriage so the antenna beam is held 40 ft. off the 203.6 mc. frequency.

Duration of operation of the radio equipment influences which power the set from 3 to 18 w without reducing the standard operating procedure of the set to be plugged into a 110 vdc source when not in use so that

ROCKET CASES!



Solar's giant rocket cases are advancing the state of the art

ADVANCED DESIGN Components require specialized design, development and manufacturing skills

Since 1957, Solar has been an industry leader in developing new materials and new fabricating techniques to increase strength, resist heat, reduce weight. Today Solar is using this background of knowledge and experience to produce giant rocket cases—nearly 50 feet in height—to exacting standards of precision and strength.

Heaviest in the largest controlled atmosphere pit furnace in the world, the cases are an important example of Solar's active leadership in the field. Twenty-five heat treating furnaces—ranging from 18 inches to 9 feet by 30 feet—are performing difficult heating, annealing, normalizing, tempering, aging, hardening and other functions for America's leading missile and space programs.

These advanced facilities—plus a team of specialists experienced in the many phases of missile design and development—are important reasons why you should consider Solar first when faced with a difficult design or fabrication problem. For details write to Dept. G-176, Solar Aircraft Co., San Diego 15, California.



JOBS WANTED! Challenging projects, well funded opportunities with Solar. Write today!

the battery power supply is rechargeable batteries are available and sealed. Weight, complete with batteries and mounted in a valise-type carrying case, is 12 lbs.

The test set will help eliminate antenna alignment and provide diagnostic communication and computer equipment balance. Gugan declares, "A fuel tank of both the ADP and DMF portions of the Taurus gear can be removed to the pilot of a high-performance aircraft prior to takeoff on an IFR flight. Similarly, knowledge that the UHF equipment is operating properly will eliminate confusion as to whether to use radio or satellite communication with another aircraft or facility here with one's own gear or those other required equipment.

Packard-Bell started development of the test set in November, 1965, and has had three units in operation. Those, along with five more in order from North America (AN/Jan. 11, p. 107) are scheduled to go aboard ships when the ADT starts severe qualification.

Presently there are 25 of another type of Packard-Bell test sets in operation with the airlines, designed to provide a functional check of the aircraft's radio transponder function. Packard-Bell has set up a production line for box-set checkers.

A recent Federal Aviation Agency order requires that transponder be checked prior to every flight.

FILTER CENTER

AN/FRT-1 recently completed the first frequency diversity stage radio, AN/FRT-35 located in Tuscaloosa, Ala. at this year's end.

Defense decreases growth—of military electronic systems, up approximately 17% to 18% over the past decade, will still be 10% to 12% by 1970, according to estimates by Commerce Department Bureau and Defense Systems Administration. This, coupled with anticipated growth in components, industrial and consumer electronics, is expected to bring industry output to \$10 billion in 1970. BDSA estimates, State of New York, produced 31% of the nation's output of military electronic equipment in 1970, with California in second place with 16%, according to an analysis by the Commerce Department Bureau and Defense Systems Administration. This, coupled with a growth of nearly 15%, delivered by Maryland with about 4% of the nation's total BDSA output according to data from BDSA. Now York is first place with 15% and Los

Angeles second with nearly 14%, followed by Philadelphia, Boston, Seattle and Chicago.

Signs on the Dotted Line—Maurice L. Johnson, recently appointed by the Defense Department to

Sperry Gyroscope Co. will develop daylight, induction and transportation power supply for AN/FRT-35 radio under \$348,000 research and development contract awarded by the Air Materiel Command's Aerospace Systems Center. Inductor will present long-period images 1,000 times brighter than those of present indicators for the radio, Sperry says.

Konradt Co., Inc. will supply an antenna system to General Electric Co., Oklahoma Dept. of Defense Electronics Division, for the Polaris program under a \$1,713,185 letter-of-award.

Era Division of AGF Industries, Inc., will produce five electronic flight and tactics simulators for the Naval Training Center, Port Washington, N. Y., under a \$2,752,000 contract. These simulators are slated for the F4W-1 and two for the PAV-7 version of the Lockheed Neptune patrol plane.

General Electric Co. Heavy Maintenance Department will develop high-vacuum, air-cooled, AN/FRT-45 test installation should demand under a \$3,600,000 contract from the Navy.

Offen-Schepers Industries, Inc., Newark, N. J., will design and manufacture digital and analog seismic magnetic tape recorders under a \$105,000 contract from Aerobics Instruments, Los Angeles, Inc.

International Telephone & Telegraph Co.'s Federal Division will produce airborne Taylor set AN/FRT-31 and airborne profile check equipment for F-105 jet interceptors under contract, amounting \$1.7 million. Hughes Aircraft Co.

NEW AVIONIC PRODUCTS

Test Equipment

Signal generator, Model FA 5131 with local and remote controls, has 18 presetatable frequencies in image form



108 to 136 mc. Generator is crystal controlled with 0.0025% stability over ambient range from -10 to 50°C. For 61 also has external power output & 115 milliwatts. Teltronics, Redondo Corp., Long Beach, Calif. N. Y.

Signal generator, Model SG 145, provides variable RF power for antenna pattern maps and covers range from 50 to 2,000 mc, selectable in an accuracy of $\pm 2\%$. Suitable for remote tuning.



control and band switching at distances beyond a mile, source provides RF output of 50 milliwatts across 50 ohms. Price is \$1,650. Tel. Atlanta, Ga. Semiconductor Affairs, Inc., 1937 Piedmont Road, N. E., Atlanta 9.

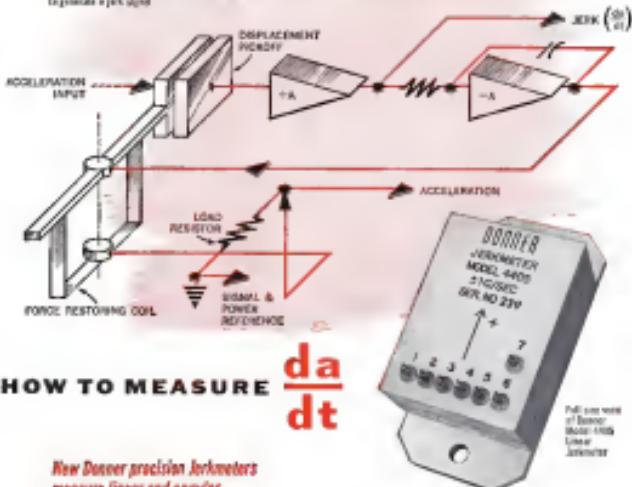
Components & Devices

Silicon transistor, Type C 112, advanced junction PIN device, has gamma-irradiated monolithic collector-emitter circuit of one century at -12 to +13C and less than one microamp at 25°C. Beta speed is 10 times 10 to 25 and reverse current voltage rating is -25 V. Crystalonics, Inc., 249 Fifth Ave., Cambridge 42, Mass.

Capacitor, Type MF (herald and MR) provide an equivalent series resistance from 10 milliohms to 10 ohms, depending from 35 to 4,000 ohms without degrading from -25 to +400°C. Capacity reduction of $\pm 10\%$ is standard, with tolerance down to $\pm 5\%$. Available MF line includes units from 1 in. length, $1/8$ in. width and $1/8$ in. thickness and MR line includes units from 4 in. length and 4 in. diameter. Capac, Inc., 61 Stanley St., New York 3, N. Y.

Switching diodes, INN20 INN21 series, can switch 1 amp pulses at 0.3 microsecond with power dissipations of 300 usec. Designed for operation up to 175°C, the INN20 series passes 200 milliwatts with 1.5 msec. mean delay in forward direction and permits a minimum leakage of 90 microamp at 175°C. Sperry Remanufacture Division, Sperry Rand Corp., So. Norwalk, Conn.

Functional diagram of Donner Linear Accelerometer. This unique instrument measures as a transducer conversion of the basic inductive type which is responsive to both linear and angular motion. The basic cell and sheet resistors are the sensing elements of the linear cell, and the two beam resistors consist of a transducer and a beam former with an integrator inserted into the sensing cell to generate a jerk signal.



HOW TO MEASURE $\frac{da}{dt}$

New Donner precision Jerkometers measure linear and angular jerk to $\pm 0.5\%$ or better.

If your measurement and control problem requires accurate measurement of linear or angular jerk or change in jerk, Donner's new line of precision angular and linear jerkometers can help.

These new instruments are the only truly sensitive devices of this type ever made. They are designed to meet the most demanding requirements. Some units can also be used to provide an output voltage proportional to jerk which can then be used as an accurate indicator of free motion.

KEY SPECIFICATIONS For Model 4405 Linear Jerkometer

RANGE	ACCELERATION	±1 g full range to ±30 g full range
OUTPUT FULL SCALE	0.000 to 0.005 in./sec. ³	±15 in. to ±15 in/sec. to ±15 in/sec. ³
RESOLUTION	0.1% full scale or better	0.2% full scale or better
LINERARITY	0.2% full scale or better	

MANUFACTURER: The new Donner Jerkometers are another product from a firm recognized as the leader in the manufacture of unique fixed and precision motion sensing systems. Donner's products are used in a wide variety of applications including aircraft control, car velocity, and aircraft vibration analysis. Complete technical information can be obtained by calling your nearest Donner engineering sales representative or writing Dept. 232.

Each jerkometer contains a linear or angular jerkometer and a high performance signal conditioner.

Typically a jerkometer installed in a jet aircraft will provide an output signal of 0.001 in./sec.³ for a change in acceleration of 20 g. This signal can be used to predict impending disaster conditions.

Other applications include one wherein control accelerometers are required. Here, the Donner Jerkometer provides a "velocity-velocity" signal. The jerkometer then provides a third order term for adding digital control devices. It can also be used as an accurate indicator of free motion.

INPUTS	OUTPUTS
ACCELERATION	0.000 to 0.005 in./sec. ³
POWER	±15 in. to ±15 in/sec. to ±15 in/sec. ³
RES	2" long, 1/8" wide, 1/8" high
RESET	7.5 minutes

DONNER SCIENTIFIC COMPANY
CONCORD, CALIFORNIA

FINANCIAL

Industry Profits Show Marked Decline

Washington—Profit margins in the aircraft industry dropped this past year to the lowest levels since the days of wholesale contract cancellations just after World War II.

The trend, under way since 1973, showed modest declines from year to year while rates were showing modest increases. Figures compiled by the Securities and Exchange Commission show The SEC computes firm margins on an annual basis for the current and comparative quarters.

Based on sales, profit margins after taxes declined from 1.4% in the third quarter of 1975 to 1.3% in the third quarter of 1979. The decline was steady through last year, the accompanying chart shows.

Based on net worth, a controversial area between the industry and the Regulators, based profit margins dropped below the range for general manufacturing. Aerospace Industries Association officials believe that in the first time aircraft companies have dropped below general manufacturing since the early postwar period. The Board has used profit on net worth to contend that industry profits are not high in these years.

Comparative Trend

The comparative trend, shown in detail in the chart, was:

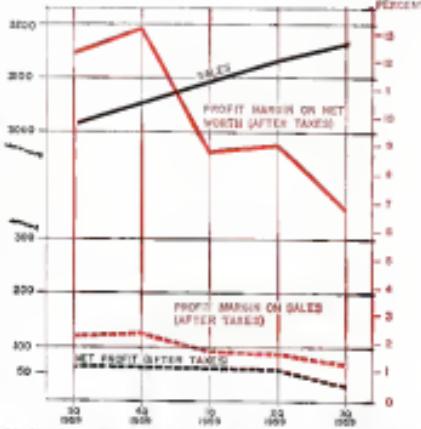
- All manufacturing—1.5%, third quarter 1979, 9.5% increase from second quarter 1978, 6.5% decrease.
- Aerospace Industry—12.4%, third quarter 1978, 6.5% third quarter 1979.

The writing group was lower than all but four of the 32 categories and subcategories listed by the SEC. The lower rates were the primary raw and steel metals and machinery categories, which probably were showing effects of the steel strike at that time. All figures are in thousands.

Comparing the two most recent quarters, rates for the industry were increasing 1.5% using the second quarter of 1979 for comparison, the increase in the third quarter was 1.5%.

The figures showed the following trends:

- All industry sales—\$1,610 million for the third quarter of 1978, \$3,139 million for the second quarter of 1979, and \$3,667 million for the third quarter 1979.
- All manufacturing sales—\$75,150 million third quarter 1978, \$83,369 million second quarter 1979, \$83,346 million third quarter 1979, up 0.1%.



COMPONENTS trend in aviation profit margins is shown in chart based on SEC figures, resulting from changing technologies and tougher competition and contracting policies.

Profit Margin

The trend of profit margin on net worth for the aviation industry since 1975 (SEC figures for full year):

Year	All	Aerospace
1975	21.4%	31.2%
1976	20.8%	31.4%
1977	17.5%	9.8%
1978	13.5%	10.7%

One AIA official said that the drop in profits will add to the problems the aviation industry will face in raising capital. The constant declining outlook is to be expected for public funding in profits will lessen the companies in the position of having to use their short term bank credit for working capital and financing new facilities out of retained earnings. Whether the latter are growing enough proportionately to offset it in the face of future demand is a point of industry concern.

The AIA said, pointing to the effi-



*You can hear the future tick
in the last silent seconds
of a Rocketdyne countdown*

OVER...THREE...TWO...ONE...a moment of silence. Then a
great speaks—and a bolt of man-made lightning flashes.

Nearly every hour of every day, Rocketdyne technicians
near that desolate desert as they test and tune the space
engines of today.

The best-equipped test facilities for high thrust rocket en-
gines in the nation are at their command. Rocketdyne's finely
instrumented test structures are located in California's Santa
Susana Mountains, Neosho, Missouri, and McGregor, Texas.

Rocketdyne engines have powered most of the military and
scientific projects conducted by the Air Force, Army, and
NASA. Now huge boosters of one and a half million pounds
of thrust are emerging from the technical know-how of Atlas,
Thor, Jupiter, and Redstone.

And even while today's countdowns go on, plans for tomor-
row's assault on space are being made. At Rocketdyne,
engineers and scientists are investigating such advanced
forms of propulsion as ion engines, nuclear engines, plasma
jets, and magnetohydrodynamic engines. Meanwhile other
groups are at work on high-energy liquid and solid propellents,
and dramatic new devices for both liquid and solid
propulsion systems.

Rocketdyne, a 12-year pioneer in rocket technology, was
first with power for America's long range ballistic missiles—
first with power for Outer Space.



ABOVE: A giant solid propellant rocket motor produced at Rocketdyne's McGregor, Texas, solid fuel facility—about 300,000
pounds of thrust, burns for about 1,000 seconds.

FIRST WITH POWER FOR OUTER SPACE

ROCKETDYNE

A DIVISION OF NORTH AMERICAN AVIATION, INC.
Englewood, Colorado • Neosho, Missouri • McGregor, Texas

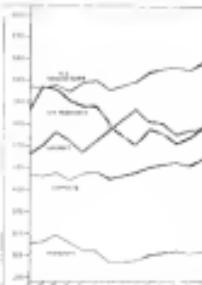
A good wheel and the reader is made for himself and his employer — makes it a habit to read his businesspaper regularly and thoroughly. You know there is no easier way to keep ahead of what goes on in your trade or industry. We offer source of useful, timely news for getting ahead in your job in your field — from the advertising and editorial pages of... your businesspaper



ROBERT T. COOPER/ASSOCIATED PRESS

Where there's business action, there's a businesspaper... where there's Aviation business, there's
**Aviation Week
and Space Technology**

One of a series of advertisements prepared by the ASSOCIATED BUSINESS PRESS for 1986



PRICE TRENDS for stocks on the New York Stock Exchange show general softening in the market for aviation services, compared with other industries. The composite figure includes manufacturing, transportation, utilities, trade finance and service groups and mining. Prices are for the last quarter of 1986. The S&P index composite price on the last of 1986 = 100.

ction of the complaints of General Accounting Office of industry pricing, of small business representatives that the industry is taking business away from small companies, and of the industry that costs are too high, summed up the situation by saying:



Rocket Sled Propels One Ton at 2,500 Fps.

Rocket sled developed for high-speed tests in test components and complete missile systems under revealed French interest is tested at Edwards AFB, N. M. North American Aviation's Rockwell Division is prime contractor for the sled. North American's Los Angeles Division participated in design and manufacture of the vehicle. It is 44 ft long and 46 in high, and is powered by a Rockwell engine using liquid oxygen and dinitro-methane-propellant fuel nitro. Thrust capacity is 200,000 lb at 10 sec. It is achieved by propelling Acceleration is up to 2.5g. The vehicle will propel one ton of payload to 2,500 fps (1,700 mph) on the test track.

"Any one who thinks the defense business is a great rock, stable mountain, better take another look."

With profits at their present level, the pace of reorganization might well become academic for the three, was poised for which the act was as fended last year. The industry still is concerned, however, over which that as being disrupted now or what might in the future be demanded for price

Collins Radio Profits Send Stock Soaring

Colts Rapids, Iowa-Sharp increase in earnings reflects the company's sale and profit on the New York Stock Exchange.

For the three-month period ending Oct. 31, Collins earned \$2.0 million in sales of \$42 million, equivalent to \$1.11 per share of the common stock outstanding.

By comparison, the company earned \$1.95 per share for all of fiscal 1986, ending July 31, on profit of \$1.7 million, based on earnings, with sales of \$17.8 million.

Collins, a Wall Street favorite of several years ago until its profit numbers in 1987 and 1988, appears to have again captured the investors' fancy. Company stock which had sold for less than \$10 a share in the summer of one year during 1988, had when traded in around \$30 in early October, opened

at \$55 per share on Dec. 8 on the New York Exchange. Following the current pattern, it dropped to about \$46 shortly afterward only to rebound to around \$57 at first-quarter earnings were announced.

At the \$76 price, Collins was selling for around 16 times its earnings, based on first-quarter profits.

The stock is a modest issue, compared with some of the electronic favorites such as Eaton and Texas Instruments which currently sell for about 40 times

Collins backlog, including contracts under negotiation, is about \$230 million, roughly the same figure as in July 1 backlog.

Company's growing sales reflect the increasing military need for communications and systems for command and control of strategic, air defense and surface weapons, a trend which appears likely to continue. However, the company also has a sizable market in industrial automation equipment and no major expansion for robotics and automation.

Improved profit picture reportedly results in part from fact that the company is able to use increasing amounts of off-the-shelf hardware and existing design work for its production contracts. Its reorganization put into effect in 1989 also appears to be a contributing factor. Each division is semi-autonomous and operates financially as if it were a spin-off company.

This has reduced costs and improved management control, the company reports.





TEXACO flies the Route of the Air Chiefs

Chippewa and Seneca, Nicoletzka and Tioga—these are some of the Air Chiefs, the Mohawk airmen that serve the Empire State on one of the best-equipped local service lines in the U.S.—and every Mohawk plane is 100% Texaco lubricated.

Mohawk has grown phenomenally since it began operations in 1948 with two single engine, four passenger aircraft. Now operating a fleet of seven pressurized Convair Coronadoats, five pressurized Convair Marlin-440s and eight modernized DC-3s, Mohawk carries over half a million passengers a year, connects every major airport New York market with New York City, through three major airports, New England and the Middle West.

Mohawk prefers Texaco lubricants and lubricants because they assure dependable equipment performance. And with the expert service provided by Texaco Lubrication Engineers, Mohawk has been able to set up efficient, cost-saving maintenance procedures.



Airlines from coast to coast have profited by teaming up with Texaco. In fact, during the past 24 years, more airmen plane miles have been flown by the scheduled domestic carriers on Texaco Aviation Engine Oil than on all other brands combined.

For more details, contact the manager of the more than 2,300 Texaco Distributing Plants, or write Texaco Inc., Aviation Sales Department, 135 East 42nd Street, New York 17, N.Y.



Financial Briefs

Monark Corp. Sales for the first quarter ended Sept. 30 were \$153,816,000 compared with \$61,125,042 for first quarter sales in fiscal 1952. Net income was \$1,463,742, or 45 cents a share as 1,826,033 common shares outstanding, compared with \$1,558,159 or 92 cents a share in 1952. Common shares for the first quarter of fiscal 1953, however, increased from 1,826,033 shares outstanding at the end of the first quarter of 1952 to 2,000,000 shares outstanding at the end of the first quarter of 1953. Earnings per common share for the first quarter of fiscal 1953, however, increased from 45 cents a share to 47 cents a share.

Hamiltonair Corp. Net earnings for the first quarter ended Oct. 31 were \$442,075, or 24 cents a share, compared with \$81,278, or 44 cents a share for the comparable 1952 period, based on 1,816,896 shares outstanding. Sales for the first quarter increased 21%, to \$195,916. Banking on Oct. 31 was \$126 million of which 65% represented commercial paper. Present year's backlog was \$25 million of which 64% represented commercial paper.

Continental Stock Investors Inc. Net income for the fiscal year ended Oct. 31 was \$2,402,836, compared with \$45,472 for the previous fiscal year. Net sales for fiscal 1952, however, totalled \$83,125,152, in comparison with sales in the previous year of \$68,812,912.

Continental Stock Investors Inc. Net income for the fiscal year ended Oct. 31 was \$2,402,836, compared with \$45,472 for the previous fiscal year. Net sales for fiscal 1952, however, totalled \$83,125,152, in comparison with sales in the previous year of \$68,812,912.

Continental Stock Investors Inc. Net income for the fiscal year ended Oct. 31 was \$2,402,836, compared with \$45,472 for the previous fiscal year. Net sales for fiscal 1952, however, totalled \$83,125,152, in comparison with sales in the previous year of \$68,812,912.

Continental Stock Investors Inc. Net income for the fiscal year ended Oct. 31 was \$2,402,836, compared with \$45,472 for the previous fiscal year. Net sales for fiscal 1952, however, totalled \$83,125,152, in comparison with sales in the previous year of \$68,812,912.

California Eastern Aviation, Inc. Net revenue was \$17,930,000 for the nine months ended Sept. 30, compared with \$18,234,451 for the

1952 fiscal period. Net income was \$124,400, or 6 cents a share for 1,061,385 common shares outstanding, compared with \$185,500 or 17 cents a share for the comparable 1952 period. Reduction in retained earnings is attributed to lower special credits in 1953 and absorption of more than \$1 million in development and engineering costs. Company, based in Washington, D.C., specializes in aircraft, electronics, maintenance and purchase and lease of transport equipment.

Relia-Airline Corp. Net earnings for the first quarter ended Oct. 31 were \$442,075, or 24 cents a share, compared with \$81,278, or 44 cents a share for the comparable 1952 period, based on 1,816,896 shares outstanding. Sales for the first quarter increased 21%, to \$195,916. Banking on Oct. 31 was \$126 million of which 65% represented commercial paper. Present year's backlog was \$25 million of which 64% represented commercial paper.

Acquisitions And Mergers

Robinson Tracked Products, Inc. Teterboro, N.J., will ask stockholders to approve the formation of a proposed merger with Kirov Tractor Corp., Kirov, U.S.S.R. The purpose of the merger is to expand the market for tracked vehicles and to offer comparable tracked units on the market. Heretofore used without a thermal plow, these plows are rapidly designed and simply adaptable to production methods. Performance characteristics that are even more precise can be provided within the same dimensions.

TRIGONAL CHARACTERISTICS
Mark Edwards
After load 100 ft. 1.87 ft
After load 200 ft. 2.00 ft
Stationary Gearing 0.05 ft
Stationary Plow 0.05 ft
Vertical Plow 0.05 ft
Drive belt load to stationary
plow 0.05 ft
20 ft. 1.07 ft
10 ft. 0.54 ft
Vertical Assemblies
0.05 ft. 0.05 ft maximum
Rear
Rear + front load
max depth 0.32
Discarding distance
0.05 ft. overall or less
Weight 0.75 ft
Run Up Time
10 minutes from -40°F
Life 2000 hours minimum
Write for complete data.

KEARFOTT DIVISION



GENERAL PRECISION
AFTER FALLS, NEW JERSEY



FLOATED RATE INTEGRATING GYROS

Specifically designed for missile applications, these Kearfott gyroscopes gyro-rotate effectively at elevated altitudes. Their outstanding accuracy and performance characteristics make them particularly suited to the needs of the missile market. Heretofore used without a thermal plow, these plows are rapidly designed and simply adaptable to production methods. Performance characteristics that are even more precise can be provided within the same dimensions.

TRIGONAL CHARACTERISTICS
Mark Edwards
After load 100 ft. 1.87 ft
After load 200 ft. 2.00 ft
Stationary Gearing 0.05 ft
Stationary Plow 0.05 ft
Vertical Plow 0.05 ft
Drive belt load to stationary
plow 0.05 ft
20 ft. 1.07 ft
10 ft. 0.54 ft
Vertical Assemblies
0.05 ft. 0.05 ft maximum
Rear
Rear + front load
max depth 0.32
Discarding distance
0.05 ft. overall or less
Weight 0.75 ft
Run Up Time
10 minutes from -40°F
Life 2000 hours minimum
Write for complete data.

For drastic weight and space reduction!

For safest handling of cryogenic, exotic,
radioactive and conventional fluids!
For unsurpassed reliability!

Product of
COMPONENTS DEPT., RMD



VENTURI Shut-off VALVES

... in modern aircraft and
missile propulsion systems,
ground handling and nuclear applications

- No dynamic seals
- Full seats
- Low pressure drop
- High reliability
- Minimum of moving parts
- Zero leakage
- Low energy requirement
- Low pressure operating
- No external actuation
- Suitable for hazardous fluids, exotic fluids

The Venturi Shut-off Valves shown here are typical of the advanced valve designs and development capability of Reaction Motors—leaders in solid propellant rocket components and support equipment. Components include all types of valves, development and qualification testing facilities, gas pressure regulators and thermostats. Components include cryogenic, boron, exotic and conventional fluids. Currently in production are large GPC, ICBM quick disconnect valves, ICBM regulators and X-15 components and valves for classified projects.

Reaction Motors can deliver valves designed to your specific requirements within 6 to 12 weeks!



COMPONENTS DEPARTMENT
REACTION MOTORS DIVISION

Thiokol CHEMICAL CORPORATION

Ford Road, Somerville, New Jersey

AVIATION WEEK, January 18, 1960

U.S. Allocates \$57,076,702 For 1960 Airport Construction

Washington—Airport construction projects for fiscal 1960 will cost \$57,076,702 in Federal funds, a sum that will be matched on a 50-50 basis by local project sponsors. Allocation was based on \$6.5 million made available by Congress under a previous extension of the Federal Airport Act.

Of the sums programmed, \$35.9 million for runway construction, 15.1% for terminals and airports and 13.7% for roads and approaches. Remaining funds will be available for planning, financing and construction.

Texas and California—with 17 each—host the largest number of projects followed by Florida with 15, and Pennsylvania with 14, and Michigan and Wisconsin with 13 each. Following is a list of the 788 projects on hand.

1960 FEDERAL AIRPORT PROGRAM Fiscal Year Appropriations

ALABAMA

Bessemer City of 100,000

Bessemer Municipal Airport

Bessemer Municipal Airport, State North

Bessemer Municipal

City of 50,000

Atlanta International Airport area for 800 passengers, 10,000 passengers, 1000 & 1100 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated. Major highway bypass 3,000 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated. Major highway bypass 3,000 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated.

Birmingham Municipal

Birmingham Municipal Airport

Birmingham Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

ALASKA

Anchorage City of 100,000

Anchorage International Airport

Port of Anchorage, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

ARIZONA

Phoenix City of 1,000,000

Phoenix Municipal Airport

Phoenix International Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

ARKANSAS

Little Rock City of 100,000

Little Rock Municipal Airport

Little Rock Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

CALIFORNIA

Los Angeles City of 1,000,000

Los Angeles International Airport

Los Angeles International Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

CONNECTICUT

Bridgeport City of 100,000

Bridgeport Municipal Airport

Bridgeport Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

DELAWARE

Wilmington City of 100,000

Wilmington Municipal Airport

Wilmington Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

FLORIDA

Orlando City of 100,000

Orlando Municipal Airport

Orlando Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

GEORGIA

Atlanta City of 1,000,000

Atlanta International Airport

Atlanta International Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

ILLINOIS

Chicago City of 1,000,000

Chicago O'Hare International Airport

Chicago O'Hare International Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

INDIANA

Indianapolis City of 100,000

Indianapolis Municipal Airport

Indianapolis Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

KANSAS

Topeka City of 100,000

Topeka Municipal Airport

Topeka Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

KENTUCKY

Louisville City of 100,000

Louisville Municipal Airport

Louisville Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

Louisiana

Baton Rouge City of 100,000

Baton Rouge Municipal Airport

Baton Rouge Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

MASSACHUSETTS

Boston City of 1,000,000

Boston Logan International Airport

Boston Logan International Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

MISSOURI

Kansas City City of 100,000

Kansas City Municipal Airport

Kansas City Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

MISSISSIPPI

Jackson City of 100,000

Jackson Municipal Airport

Jackson Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

MISSOURI

St. Louis City of 1,000,000

St. Louis Lambert International Airport

St. Louis Lambert International Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEVADA

Las Vegas City of 100,000

Las Vegas Municipal Airport

Las Vegas Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW JERSEY

Paterson City of 100,000

Paterson Municipal Airport

Paterson Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Albany City of 100,000

Albany Municipal Airport

Albany Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

Buffalo Municipal Airport

Buffalo Municipal Airport, 1000 ft. 300 ft. runways, 100 ft. wide, 100 ft. 300 ft. elevated and roadway

TOTAL: \$1,000,000

NEW YORK

Buffalo City of 100,000

feed-thru,
multiple
insert
HYFEN®
connector
with crimp-type,
snap-locked
contacts

Another example of
the design of the
modular units
designed to meet
military standards
and to be inserted
in a fraction of a second.



crimp-type

MODULAR ELECTRICAL CONNECTORS

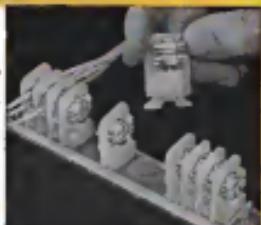
IN 3 NEW BASIC TYPES

Modular units by Burndy provide versatile, rapid and reliable answers to the problem of connecting a multiplicity of wires in relatively limited spaces. Crimp contacts—installed with any of several hand, pneumatic, semi-automatic or automatic tools—can be removed, re-torqued or replaced, providing the most complete flexibility in the connector field. Computers, ground-based radar, missile ground controls, and instrumentation are typical applications for Burndy modular connectors.

quick-disconnect
or permanently
connected
MODULOK®
terminal block

with snap-in,
spring-loaded
contacts

True versatility in a
terminal block. 30
positions. Quick-dis-
connect or permanent
connection. Snap-in
spring-loaded contacts
make it permanent
connection.



crimp-type,
solid-shank
STAPIN®
paper pin
contacts

As in the other
modular units,
the contacts
can be easily
removed, re-torqued
and replaced.



For complete information, write: EMATRON DIVISION

BURNDY

Burndy, Connect.
In Europe: Antwerp, Belgium
In Canada: Toronto, Ontario

Connect. 11,250
City of Laurel 11,250
Loring Air Force Base
Angola, Ind.—400 acre zone

Missouri 11,250

Point Lookout Plant
Anchorage, Alaska—For clear seas
and flat land. 1000 ft. 2000 ft.
4000 ft. 5000 ft. 6000 ft. 7000 ft.
1000 ft. 1500 ft. 2000 ft.
1000 ft. 1500 ft. 2000 ft.

Alabama 11,250

University of Mississippi
University of Mississippi
Columbus, Miss. 11,250

Texas City 11,250

City of Texas City
Texas City, Texas
Lignite 1000 acre zone
TOTAL 11,250,000

Kansas City 11,250

City of Kansas City
Missouri—Industrial

Proven site for future and eco-
nomic industrial growth and continuing
expansion. Good industrial zoning
conditions and expense—minimum
leases within 1000 ft. and 1500 ft.
in capacity. Good industrial zoning
and surface topography, surface rock
outcrops and some 1000 ft. of 500 ft.
tunnels.

Belmont 11,250

City of Belmont 11,250
City of Belmont, Calif.—Industrial
development including 1000 ft. of north
toward and toward ocean at 500
feet elevation. 1000 ft. 1500 ft.
2000 ft. 2500 ft. 3000 ft. 3500 ft.
4000 ft. 4500 ft. 5000 ft. 5500 ft.
6000 ft. 6500 ft. 7000 ft. 7500 ft.
8000 ft. 8500 ft. 9000 ft. 9500 ft.
10000 ft. 10500 ft. 11000 ft. 11500 ft.
12000 ft. 12500 ft. 13000 ft. 13500 ft.
14000 ft. 14500 ft. 15000 ft. 15500 ft.
16000 ft. 16500 ft. 17000 ft. 17500 ft.
18000 ft. 18500 ft. 19000 ft. 19500 ft.
20000 ft. 20500 ft. 21000 ft. 21500 ft.
22000 ft. 22500 ft. 23000 ft. 23500 ft.
24000 ft. 24500 ft. 25000 ft. 25500 ft.
26000 ft. 26500 ft. 27000 ft. 27500 ft.
28000 ft. 28500 ft. 29000 ft. 29500 ft.
30000 ft. 30500 ft. 31000 ft. 31500 ft.
32000 ft. 32500 ft. 33000 ft. 33500 ft.
34000 ft. 34500 ft. 35000 ft. 35500 ft.
36000 ft. 36500 ft. 37000 ft. 37500 ft.
38000 ft. 38500 ft. 39000 ft. 39500 ft.
40000 ft. 40500 ft. 41000 ft. 41500 ft.
42000 ft. 42500 ft. 43000 ft. 43500 ft.
44000 ft. 44500 ft. 45000 ft. 45500 ft.
46000 ft. 46500 ft. 47000 ft. 47500 ft.
48000 ft. 48500 ft. 49000 ft. 49500 ft.
50000 ft. 50500 ft. 51000 ft. 51500 ft.
52000 ft. 52500 ft. 53000 ft. 53500 ft.
54000 ft. 54500 ft. 55000 ft. 55500 ft.
56000 ft. 56500 ft. 57000 ft. 57500 ft.
58000 ft. 58500 ft. 59000 ft. 59500 ft.
60000 ft. 60500 ft. 61000 ft. 61500 ft.
62000 ft. 62500 ft. 63000 ft. 63500 ft.
64000 ft. 64500 ft. 65000 ft. 65500 ft.
66000 ft. 66500 ft. 67000 ft. 67500 ft.
68000 ft. 68500 ft. 69000 ft. 69500 ft.
70000 ft. 70500 ft. 71000 ft. 71500 ft.
72000 ft. 72500 ft. 73000 ft. 73500 ft.
74000 ft. 74500 ft. 75000 ft. 75500 ft.
76000 ft. 76500 ft. 77000 ft. 77500 ft.
78000 ft. 78500 ft. 79000 ft. 79500 ft.
80000 ft. 80500 ft. 81000 ft. 81500 ft.
82000 ft. 82500 ft. 83000 ft. 83500 ft.
84000 ft. 84500 ft. 85000 ft. 85500 ft.
86000 ft. 86500 ft. 87000 ft. 87500 ft.
88000 ft. 88500 ft. 89000 ft. 89500 ft.
90000 ft. 90500 ft. 91000 ft. 91500 ft.
92000 ft. 92500 ft. 93000 ft. 93500 ft.
94000 ft. 94500 ft. 95000 ft. 95500 ft.
96000 ft. 96500 ft. 97000 ft. 97500 ft.
98000 ft. 98500 ft. 99000 ft. 99500 ft.
100000 ft. 100500 ft. 101000 ft. 101500 ft.
102000 ft. 102500 ft. 103000 ft. 103500 ft.
104000 ft. 104500 ft. 105000 ft. 105500 ft.
106000 ft. 106500 ft. 107000 ft. 107500 ft.
108000 ft. 108500 ft. 109000 ft. 109500 ft.
110000 ft. 110500 ft. 111000 ft. 111500 ft.
112000 ft. 112500 ft. 113000 ft. 113500 ft.
114000 ft. 114500 ft. 115000 ft. 115500 ft.
116000 ft. 116500 ft. 117000 ft. 117500 ft.
118000 ft. 118500 ft. 119000 ft. 119500 ft.
120000 ft. 120500 ft. 121000 ft. 121500 ft.
122000 ft. 122500 ft. 123000 ft. 123500 ft.
124000 ft. 124500 ft. 125000 ft. 125500 ft.
126000 ft. 126500 ft. 127000 ft. 127500 ft.
128000 ft. 128500 ft. 129000 ft. 129500 ft.
130000 ft. 130500 ft. 131000 ft. 131500 ft.
132000 ft. 132500 ft. 133000 ft. 133500 ft.
134000 ft. 134500 ft. 135000 ft. 135500 ft.
136000 ft. 136500 ft. 137000 ft. 137500 ft.
138000 ft. 138500 ft. 139000 ft. 139500 ft.
140000 ft. 140500 ft. 141000 ft. 141500 ft.
142000 ft. 142500 ft. 143000 ft. 143500 ft.
144000 ft. 144500 ft. 145000 ft. 145500 ft.
146000 ft. 146500 ft. 147000 ft. 147500 ft.
148000 ft. 148500 ft. 149000 ft. 149500 ft.
150000 ft. 150500 ft. 151000 ft. 151500 ft.
152000 ft. 152500 ft. 153000 ft. 153500 ft.
154000 ft. 154500 ft. 155000 ft. 155500 ft.
156000 ft. 156500 ft. 157000 ft. 157500 ft.
158000 ft. 158500 ft. 159000 ft. 159500 ft.
160000 ft. 160500 ft. 161000 ft. 161500 ft.
162000 ft. 162500 ft. 163000 ft. 163500 ft.
164000 ft. 164500 ft. 165000 ft. 165500 ft.
166000 ft. 166500 ft. 167000 ft. 167500 ft.
168000 ft. 168500 ft. 169000 ft. 169500 ft.
170000 ft. 170500 ft. 171000 ft. 171500 ft.
172000 ft. 172500 ft. 173000 ft. 173500 ft.
174000 ft. 174500 ft. 175000 ft. 175500 ft.
176000 ft. 176500 ft. 177000 ft. 177500 ft.
178000 ft. 178500 ft. 179000 ft. 179500 ft.
180000 ft. 180500 ft. 181000 ft. 181500 ft.
182000 ft. 182500 ft. 183000 ft. 183500 ft.
184000 ft. 184500 ft. 185000 ft. 185500 ft.
186000 ft. 186500 ft. 187000 ft. 187500 ft.
188000 ft. 188500 ft. 189000 ft. 189500 ft.
190000 ft. 190500 ft. 191000 ft. 191500 ft.
192000 ft. 192500 ft. 193000 ft. 193500 ft.
194000 ft. 194500 ft. 195000 ft. 195500 ft.
196000 ft. 196500 ft. 197000 ft. 197500 ft.
198000 ft. 198500 ft. 199000 ft. 199500 ft.
200000 ft. 200500 ft. 201000 ft. 201500 ft.
202000 ft. 202500 ft. 203000 ft. 203500 ft.
204000 ft. 204500 ft. 205000 ft. 205500 ft.
206000 ft. 206500 ft. 207000 ft. 207500 ft.
208000 ft. 208500 ft. 209000 ft. 209500 ft.
210000 ft. 210500 ft. 211000 ft. 211500 ft.
212000 ft. 212500 ft. 213000 ft. 213500 ft.
214000 ft. 214500 ft. 215000 ft. 215500 ft.
216000 ft. 216500 ft. 217000 ft. 217500 ft.
218000 ft. 218500 ft. 219000 ft. 219500 ft.
220000 ft. 220500 ft. 221000 ft. 221500 ft.
222000 ft. 222500 ft. 223000 ft. 223500 ft.
224000 ft. 224500 ft. 225000 ft. 225500 ft.
226000 ft. 226500 ft. 227000 ft. 227500 ft.
228000 ft. 228500 ft. 229000 ft. 229500 ft.
230000 ft. 230500 ft. 231000 ft. 231500 ft.
232000 ft. 232500 ft. 233000 ft. 233500 ft.
234000 ft. 234500 ft. 235000 ft. 235500 ft.
236000 ft. 236500 ft. 237000 ft. 237500 ft.
238000 ft. 238500 ft. 239000 ft. 239500 ft.
240000 ft. 240500 ft. 241000 ft. 241500 ft.
242000 ft. 242500 ft. 243000 ft. 243500 ft.
244000 ft. 244500 ft. 245000 ft. 245500 ft.
246000 ft. 246500 ft. 247000 ft. 247500 ft.
248000 ft. 248500 ft. 249000 ft. 249500 ft.
250000 ft. 250500 ft. 251000 ft. 251500 ft.
252000 ft. 252500 ft. 253000 ft. 253500 ft.
254000 ft. 254500 ft. 255000 ft. 255500 ft.
256000 ft. 256500 ft. 257000 ft. 257500 ft.
258000 ft. 258500 ft. 259000 ft. 259500 ft.
260000 ft. 260500 ft. 261000 ft. 261500 ft.
262000 ft. 262500 ft. 263000 ft. 263500 ft.
264000 ft. 264500 ft. 265000 ft. 265500 ft.
266000 ft. 266500 ft. 267000 ft. 267500 ft.
268000 ft. 268500 ft. 269000 ft. 269500 ft.
270000 ft. 270500 ft. 271000 ft. 271500 ft.
272000 ft. 272500 ft. 273000 ft. 273500 ft.
274000 ft. 274500 ft. 275000 ft. 275500 ft.
276000 ft. 276500 ft. 277000 ft. 277500 ft.
278000 ft. 278500 ft. 279000 ft. 279500 ft.
280000 ft. 280500 ft. 281000 ft. 281500 ft.
282000 ft. 282500 ft. 283000 ft. 283500 ft.
284000 ft. 284500 ft. 285000 ft. 285500 ft.
286000 ft. 286500 ft. 287000 ft. 287500 ft.
288000 ft. 288500 ft. 289000 ft. 289500 ft.
290000 ft. 290500 ft. 291000 ft. 291500 ft.
292000 ft. 292500 ft. 293000 ft. 293500 ft.
294000 ft. 294500 ft. 295000 ft. 295500 ft.
296000 ft. 296500 ft. 297000 ft. 297500 ft.
298000 ft. 298500 ft. 299000 ft. 299500 ft.
300000 ft. 300500 ft. 301000 ft. 301500 ft.
302000 ft. 302500 ft. 303000 ft. 303500 ft.
304000 ft. 304500 ft. 305000 ft. 305500 ft.
306000 ft. 306500 ft. 307000 ft. 307500 ft.
308000 ft. 308500 ft. 309000 ft. 309500 ft.
310000 ft. 310500 ft. 311000 ft. 311500 ft.
312000 ft. 312500 ft. 313000 ft. 313500 ft.
314000 ft. 314500 ft. 315000 ft. 315500 ft.
316000 ft. 316500 ft. 317000 ft. 317500 ft.
318000 ft. 318500 ft. 319000 ft. 319500 ft.
320000 ft. 320500 ft. 321000 ft. 321500 ft.
322000 ft. 322500 ft. 323000 ft. 323500 ft.
324000 ft. 324500 ft. 325000 ft. 325500 ft.
326000 ft. 326500 ft. 327000 ft. 327500 ft.
328000 ft. 328500 ft. 329000 ft. 329500 ft.
330000 ft. 330500 ft. 331000 ft. 331500 ft.
332000 ft. 332500 ft. 333000 ft. 333500 ft.
334000 ft. 334500 ft. 335000 ft. 335500 ft.
336000 ft. 336500 ft. 337000 ft. 337500 ft.
338000 ft. 338500 ft. 339000 ft. 339500 ft.
340000 ft. 340500 ft. 341000 ft. 341500 ft.
342000 ft. 342500 ft. 343000 ft. 343500 ft.
344000 ft. 344500 ft. 345000 ft. 345500 ft.
346000 ft. 346500 ft. 347000 ft. 347500 ft.
348000 ft. 348500 ft. 349000 ft. 349500 ft.
350000 ft. 350500 ft. 351000 ft. 351500 ft.
352000 ft. 352500 ft. 353000 ft. 353500 ft.
354000 ft. 354500 ft. 355000 ft. 355500 ft.
356000 ft. 356500 ft. 357000 ft. 357500 ft.
358000 ft. 358500 ft. 359000 ft. 359500 ft.
360000 ft. 360500 ft. 361000 ft. 361500 ft.
362000 ft. 362500 ft. 363000 ft. 363500 ft.
364000 ft. 364500 ft. 365000 ft. 365500 ft.
366000 ft. 366500 ft. 367000 ft. 367500 ft.
368000 ft. 368500 ft. 369000 ft. 369500 ft.
370000 ft. 370500 ft. 371000 ft. 371500 ft.
372000 ft. 372500 ft. 373000 ft. 373500 ft.
374000 ft. 374500 ft. 375000 ft. 375500 ft.
376000 ft. 376500 ft. 377000 ft. 377500 ft.
378000 ft. 378500 ft. 379000 ft. 379500 ft.
380000 ft. 380500 ft. 381000 ft. 381500 ft.
382000 ft. 382500 ft. 383000 ft. 383500 ft.
384000 ft. 384500 ft. 385000 ft. 385500 ft.
386000 ft. 386500 ft. 387000 ft. 387500 ft.
388000 ft. 388500 ft. 389000 ft. 389500 ft.
390000 ft. 390500 ft. 391000 ft. 391500 ft.
392000 ft. 392500 ft. 393000 ft. 393500 ft.
394000 ft. 394500 ft. 395000 ft. 395500 ft.
396000 ft. 396500 ft. 397000 ft. 397500 ft.
398000 ft. 398500 ft. 399000 ft. 399500 ft.
400000 ft. 400500 ft. 401000 ft. 401500 ft.
402000 ft. 402500 ft. 403000 ft. 403500 ft.
404000 ft. 404500 ft. 405000 ft. 405500 ft.
406000 ft. 406500 ft. 407000 ft. 407500 ft.
408000 ft. 408500 ft. 409000 ft. 409500 ft.
410000 ft. 410500 ft. 411000 ft. 411500 ft.
412000 ft. 412500 ft. 413000 ft. 413500 ft.
414000 ft. 414500 ft. 415000 ft. 415500 ft.
416000 ft. 416500 ft. 417000 ft. 417500 ft.
418000 ft. 418500 ft. 419000 ft. 419500 ft.
420000 ft. 420500 ft. 421000 ft. 421500 ft.
422000 ft. 422500 ft. 423000 ft. 423500 ft.
424000 ft. 424500 ft. 425000 ft. 425500 ft.
426000 ft. 426500 ft. 427000 ft. 427500 ft.
428000 ft. 428500 ft. 429000 ft. 429500 ft.
430000 ft. 430500 ft. 431000 ft. 431500 ft.
432000 ft. 432500 ft. 433000 ft. 433500 ft.
434000 ft. 434500 ft. 435000 ft. 435500 ft.
436000 ft. 436500 ft. 437000 ft. 437500 ft.
438000 ft. 438500 ft. 439000 ft. 439500 ft.
440000 ft. 440500 ft. 441000 ft. 441500 ft.
442000 ft. 442500 ft. 443000 ft. 443500 ft.
444000 ft. 444500 ft. 445000 ft. 445500 ft.
446000 ft. 446500 ft. 447000 ft. 447500 ft.
448000 ft. 448500 ft. 449000 ft. 449500 ft.
450000 ft. 450500 ft. 451000 ft. 451500 ft.
452000 ft. 452500 ft. 453000 ft. 453500 ft.
454000 ft. 454500 ft. 455000 ft. 455500 ft.
456000 ft. 456500 ft. 457000 ft. 457500 ft.
458000 ft. 458500 ft. 459000 ft. 459500 ft.
460000 ft. 460500 ft. 461000 ft. 461500 ft.
462000 ft. 462500 ft. 463000 ft. 463500 ft.
464000 ft. 464500 ft. 465000 ft. 465500 ft.
466000 ft. 466500 ft. 467000 ft. 467500 ft.
468000 ft. 468500 ft. 469000 ft. 469500 ft.
470000 ft. 470500 ft. 471000 ft. 471500 ft.
472000 ft. 472500 ft. 473000 ft. 473500 ft.
474000 ft. 474500 ft. 475000 ft. 475500 ft.
476000 ft. 476500 ft. 477000 ft. 477500 ft.
478000 ft. 478500 ft. 479000 ft. 479500 ft.
480000 ft. 480500 ft. 481000 ft. 481500 ft.
482000 ft. 482500 ft. 483000 ft. 483500 ft.
484000 ft. 484500 ft. 485000 ft. 485500 ft.
486000 ft. 486500 ft. 487000 ft. 487500 ft.
488000 ft. 488500 ft. 489000 ft. 489500 ft.
490000 ft. 490500 ft. 491000 ft. 491500 ft.
492000 ft. 492500 ft. 493000 ft. 493500 ft.
494000 ft. 494500 ft. 495000 ft. 495500 ft.
496000 ft. 496500 ft. 497000 ft. 497500 ft.
498000 ft. 498500 ft. 499000 ft. 499500 ft.
500000 ft. 500500 ft. 501000 ft. 501500 ft.
502000 ft. 502500 ft. 503000 ft. 503500 ft.
504000 ft. 504500 ft. 505000 ft. 505500 ft.
506000 ft. 506500 ft. 507000 ft. 507500 ft.
508000 ft. 508500 ft. 509000 ft. 509500 ft.
510000 ft. 510500 ft. 511000 ft. 511500 ft.
512000 ft. 512500 ft. 513000 ft. 513500 ft.
514000 ft. 514500 ft. 515000 ft. 515500 ft.
516000 ft. 516500 ft. 517000 ft. 517500 ft.
518000 ft. 518500 ft. 519000 ft. 519500 ft.
520000 ft. 520500 ft. 521000 ft. 521500 ft.
522000 ft. 522500 ft. 523000 ft. 523500 ft.
524000 ft. 524500 ft. 525000 ft. 525500 ft.
526000 ft. 526500 ft. 527000 ft. 527500 ft.
528000 ft. 528500 ft. 529000 ft. 529500 ft.
530000 ft. 530500 ft. 531000 ft. 531500 ft.
532000 ft. 532500 ft. 533000 ft. 533500 ft.
534000 ft. 534500 ft. 535000 ft. 535500 ft.
536000 ft. 536500 ft. 537000 ft. 537500 ft.
538000 ft. 538500 ft. 539000 ft. 539500 ft.
540000 ft. 540500 ft. 541000 ft. 541500 ft.
542000 ft. 542500 ft. 543000 ft. 543500 ft.
544000 ft. 544500 ft. 545000 ft. 545500 ft.
546000 ft. 546500 ft. 547000 ft. 547500 ft.
548000 ft. 548500 ft. 549000 ft. 549500 ft.
550000 ft. 550500 ft. 551000 ft. 551500 ft.
552000 ft. 552500 ft. 553000 ft. 553500 ft.
554000 ft. 554500 ft. 555000 ft. 555500 ft.
556000 ft. 556500 ft. 557000 ft. 557500 ft.
558000 ft. 558500 ft. 559000 ft. 559500 ft.
560000 ft. 560500 ft. 561000 ft. 561500 ft.
562000 ft. 562500 ft. 563000 ft. 563500 ft.
564000 ft. 564500 ft. 565000 ft. 565500 ft.
566000 ft. 566500 ft. 567000 ft. 567500 ft.
568000 ft. 568500 ft. 569000 ft. 569500 ft.
570000 ft. 570500 ft. 571000 ft. 571500 ft.
572000 ft. 572500 ft. 573000 ft. 573500 ft.
574000 ft. 574500 ft. 575000 ft. 575500 ft.
576000 ft. 576500 ft. 577000 ft. 577500 ft.
578000 ft. 578500 ft. 579000 ft. 579500 ft.
580000 ft. 580500 ft. 581000 ft. 581500 ft.
582000 ft. 582500 ft. 583000 ft. 583500 ft.
584000 ft. 584500 ft. 585

SCIENTISTS AND ENGINEERS: There are two sides to the STL coin...



What STL does:

Space Technology Laboratories is making significant contributions in theoretical analysis, research, development and technical management of advanced ballistic missile and space systems. STL conducts advanced space flight experiments under the executive management of the Air Force on behalf of such agencies as AFPLA and NASA. In addition, STL's leadership in military applications of space technology is illustrated by its successful space planning as the contractor responsible for overall systems engineering and technical direction of the Atlas, Titan, Thor, and Minuteman portions of the Air Force Ballistic Missile Program.

What STL offers:

For scientists and engineers with outstanding capabilities, STL offers unusual growth opportunities in many areas of technical activity, including:

- Electronic and Electro-mechanical Systems
- Vehicle Engineering and Development
- Propulsion and Guidance Systems
- Computer Technology
- Systems Engineering and Technical Direction
- Telecommunications
- Airborne Systems
- General Support Equipment



The Technical Staff of STL is the largest professional group in the nation devoted exclusively to research, development, and systems engineering in the field of ballistic missiles, space projects, and related advanced technology. If you want to apply your skills and talents in these advanced areas working with leaders in your field, investigate positions at STL now. Please send your resume today to Mr. Richard A. Holdung.

Space Technology Laboratories, Inc., P.O. Box 5000

Los Angeles, California



SPACE TECHNOLOGY LABORATORIES, INC.

St. Louis
City of St. Louis
St. Louis Municipal Airport
Missouri, 63110. Located in the heart of the city, 10 miles west of downtown, 3,000' landing strip, asphalt paved, 1000' long.

St. Paul
City of St. Paul
Wingra Field, airport
Anoka, Minnesota, 55301. Located 10 miles west of downtown, 3,000' asphalt runway and 1,000' landing strip, asphalt paved, 1000' long.

TOTAL \$11,000

W. THOMAS

W. THOMAS
City of St. Paul
Wingra Field, airport
Anoka, Minnesota, 55301. Located 10 miles west of downtown, 3,000' asphalt runway and 1,000' landing strip, asphalt paved, 1000' long.

Johns \$10,000
T. John
St. Louis Municipal Airport
Airport, 63110. Located 10 miles west of downtown, 3,000' asphalt runway and 1,000' landing strip, asphalt paved, 1000' long.

Johns \$10,000
T. John
St. Louis Municipal Airport
Airport, 63110. Located 10 miles west of downtown, 3,000' asphalt runway and 1,000' landing strip, asphalt paved, 1000' long.

Johns \$10,000
T. John
St. Louis Municipal Airport
Airport, 63110. Located 10 miles west of downtown, 3,000' asphalt runway and 1,000' landing strip, asphalt paved, 1000' long.

TOTAL \$11,000

PORTO RICO

Porto Rico
Puerto Rico Dept. Authority
Porto Rico International Airport
Arecibo, Puerto Rico, 00612. Located 10 miles west of downtown, 3,000' asphalt runway and 1,000' landing strip, asphalt paved, 1000' long.

TOTAL \$11,000

URUGUAY

Uruguay
Government of the
Uruguay
Montevideo International Airport
Montevideo, Uruguay, 11000. Located 10 miles west of downtown, 3,000' asphalt runway and 1,000' landing strip, asphalt paved, 1000' long.

TOTAL \$11,000

U.S. OVERSEAS

U.S. Overseas
Government of the
U.S. Overseas
Abu Dhabi, United Arab Emirates
U.S. Overseas, Abu Dhabi, United Arab Emirates, 11000. Located 10 miles west of downtown, 3,000' asphalt runway and 1,000' landing strip, asphalt paved, 1000' long.

TOTAL \$11,000

**Oakland Approves
New Terminal Plans**

Oakland, Calif. Utilized Board of Port Commissioners has approved final plans for a new \$4,750,000 passenger terminal at Metropolitan Oakland International Airport.

Joint engineering program also is under way to build a 10,000-ft. high-speed freight runway with two miles in each of an elevated and earth approaches at each end, a separate air freight building and new parking lot. All to be constructed on 660 acres purchased by port commissioners for \$1.5 million in 1964 from San Francisco Bay.

Terminal building will be financed with the remaining \$1 million of a \$10 million general obligation bond issue, \$1,555,000 in federal funds, and the Port of Oakland's own financial resources.

A SPECIAL KIND OF POSITION FOR SPECIAL KIND OF MEN

To help meet the expert and continuing problems of national security, RCA has created an Advanced Military Systems Department at Princeton, New Jersey. There, in an atmosphere of complete intellectual freedom, men of a very special kind are engaged in highly sophisticated analysis and study of our national defense—present and future—and how they can be made most effective to meeting future enemy capability.

THE POSITION: Studies conducted by the RCA Advanced Military Systems Department are of the broadest scope and cover such diverse areas as physical and engineering sciences, military science, economics and geopolitics. Accordingly, each member of the technical staff may select his own area of work. The only requirement: results must have a direct application to problems of national defense.

Each staff member is provided with every opportunity, facility and detail of environment to use his creative and analytical skills to maximum advantage and at the highest level. He has no responsibility for administrative details. He can call on our specialists as may need. He has full access to all scientific, technical, military, industrial and industrial publications. Specialized research projects and laboratory work can be carried out at his request by other departments of RCA.

THE MEN: The men who form the technical staff are a group of outstanding individuals. They are recruited to responsible positions in technical research, advanced development, or systems planning. Most of them have an extensive background in the broad fields of electronics, vehicle systems design, range or terminal, physics, optics, nuclear, or plasma, or operations research (military research). All are men who enjoy seeing the fruits of their work have a far-reaching effect on the defense of the country.

THE LOCATION: Princeton offers unique social, cultural and educational advantages. The RCA Advanced Military Systems Department itself occupies a new, air-conditioned building on the quiet, spacious grounds of RCA's David Sarnoff Research Center.

INTERESTS ARE INVITED: If you are interested in learning more about this far-reaching program and the unusual opportunities it offers to qualified men, write:

Dr. N. J. Karmaz, Director
Advanced Military Systems, Dept. AWIA
RADIO CORPORATION OF AMERICA
Princeton, New Jersey



**RADIO CORPORATION
OF AMERICA**

BUSINESS FLYING



JOB 5 sport and business flying plane has good pilot visibility; plane can be used for aerobatics and towing gliders

JOB 5 Sport Plane Enters Final Testing

By Edith Wallad

Spatz-Dorni, Austria's first prototype of the JOB 5 two- to three-seat, low-wing, all-metal monoplane, built by Josef Oberholzer Holzindustrie, has its new upsliding front-type seats.

This is the first powered aircraft to be powered by the company's own liquid-fuel engine that has a 100-hp and an completely innovative coupled with easy and inexpensive maintenance will help to generate considerable interest in the plane, particularly among area clubs and schools as well as private pilots.

The firm, founded in 1940, is well established as a glider designer and manufacturer. It has built approximately 4,000 gliders, so far as of about the Stomado, Mg 31, Lo 100 and Lo 110, for example, have won international recognition and championships in several countries.

During the last 10 years the engineers have also manufactured and repaired aircraft for private owners and various air clubs.

Designed by Austrian engineer Alexander of Oberholzer for business sport and business flying, the JOB 5 can be



FUTURE modifications include a change to tricycle landing gear and biplace seating

NEW FLIGHT FRONTIERS AND SPACE MISSIONS

Bold planes revealed in Lockheed's program of total flight technology

Air/Space travel, whether the vehicle is manned or unmanned, poses vast problems. To expand the total technology of flight, Lockheed's California Division proposes bold new concepts for both military and commercial vehicles. In line with this, the Company has assumed major responsibility for Research and Development on future space vehicles. This responsibility extends from development of advanced components to major complex systems.

Advanced projects to spring from this broad base of Air/Space travel include: Lunotowise-Helicopters designed for shuttle service between large cities and satellites, or to transport payloads; Mach 6-7 Air Transport able to take off and land vertically; Space Transport capable of transporting, to an orbit of more than 1000 miles, a pilot and 1000 pounds of payload, or three passengers equipped to work in space; advanced

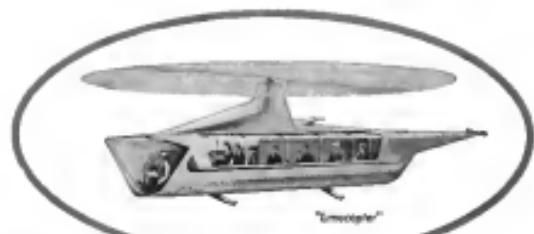
Infrared Systems studies at an advanced detection method; and Solar Radiation studies.

This markedly expanded program into the total concept of flight creates a great need for personnel with high-level skills. The concept ranges from subsonic to hypersonic speeds, from atmosphere to outer space vehicles.

High-caliber scientists and engineers are invited to take advantage of this need, to investigate the many career opportunities Lockheed offers.

Internship openings are available in: Aero-thermodynamics; propulsion, armament, electronics - research, space; packaging, servomechanisms - flight control; sound and vibration, physics - infrared, acoustics, electromechanical, antennas and telemetry.

Write today to: Mr. E. W. Dex Launers, Manager Professional Personnel Staff, Dept. 11012, 2400 North Hollywood Way, Burbank, California.



LOCKHEED

CALIFORNIA DIVISION

ANNOUNCING



27th ANNUAL INVENTORY OF AEROSPACE POWER

PUBLISHING DATE: MARCH 7, 1980

SPACE RESERVATIONS CLOSE
February 15, 1980

A REVIEW AND PREVIEW
OF WORLD-WIDE AVIATION
MISSILE AND SPACE DEVELOPMENTS

Space Probe . . . Satellites . . . ICBMs . . . Man in Space . . .
Multi-Million Pound Thrust Engines . . . Nuclear Powered
Aircraft . . . Supersonic Transport . . . Aerial Jeeps . . .
... for some of the dramatic breakthroughs in aviation,
missile and space programs which have captured the
imagination and thinking of scientific, military, government
and industry planners.

In the world's most dynamic industry, interpreting these
creations is vital to our aerospace writers. Each event must
be studied individually and in terms of industry-wide
technological directions. The galloping pace of progress
makes it impossible for even well informed engineering
managers to do this job . . . it takes specialists.

RECOGNIZED AUTHORITY

For 26 years, key engineering-management cast . . . the
decision makers . . . have turned to the industry's top
technical reporting team and the Inventory of Aerospace Power.
The Inventory Issue has won unmatched reputation
and respect as the most authoritative source of information
in aviation and its related technologies. It is a product of specialists . . . 32 graduate engineers and
technicians hundreds of technical and market developments
in their specialty. Once a year, these experts are convened
and brought to focus in special reports on current and
future programs . . . The Inventory of Aerospace Power.

CONTENTS OF THE INVENTORY ISSUE

Charts, graphs, tables, specifications will cover in detail,
budgets, timelines, manufacturing, engineering, systems
and many other areas of military and civil aviation. Included
is the most complete source for detailed specifications
on U.S. and Foreign aircraft, missiles, helicopters,
engines and space vehicles.

ADVERTISERS' BENEFITS

The Inventory Issue is a rare opportunity to place your
advertising message in a climate of proven value of impact.
Reader interest generated by press stories and vital
editorial content assures year-round use. Your boast as
multiple exposure of your advertising message. Standard
and editorial forward self-permit copy to prevent advertising
as an inappropriate section. Reader service cards are
included to handle reader inquiries. Advertising in last
year's issue received over 2,000 inquiries in twelve months.
Were, were or better yet . . . PHONE your AVIATION
WEEK Director Manager for additional information.
Regular space rates apply.



 **Aviation Week**
Including Space Technology

Will tomorrow be a challenge ...or a bore?



If you feel that your present job is not fully tapping your potential, here are 4 new career opportunities for Electronics Engineers that have every bit of the challenge you may be looking for...

1 Air Systems Reliability Engineer: This position calls for a sourced engineer capable of integrating and directing on-site reliability assurance activities necessary to secure customer acceptance of the detection systems. Unusual combination of technical ability, relations and communications (written and spoken) is equal to the challenge.

2 Radar Equipment Systems Specialist: This position calls for a creative engineer capable of assessing and directing the design of long-range radar systems. Desirable experience includes around ten years in

3 Advanced Systems Engineer: This position calls for a creative engineer capable of defining future defense and space detection problems as well as the ability to conceive and establish the feasibility of optimum system solutions to these problems—making use of the most advanced techniques and concepts. He must recognize the need for and coordinate the development of new techniques and the application of

4 Advanced Radar Systems Analysis and Development Engineer: Engineers are needed who are able to visualize and define future defense and space problems—especially advanced radar systems to solve them. An advanced degree and/or strong background in system analysis and design is essential. Assignments are

required. Desirable experience includes approximately ten years in design and field installation of transmission and electronic systems with ability in both electronic and mechanical fields. Ability to motivate technicians for optimum performance is necessary. Salary structure is equal to the challenge.

at least one of the following: radar systems design, antenna systems, R.F. components, radar receiver systems or radar data processing systems. Salary structure is equal to the challenge.

new phenomena in the area of detection systems. Background desired: Bachelor degree plus a combination of advanced training and several years experience in both the theoretical and practical aspects of detection systems engineering. A desire to work in the conceptual phase of a system is desired with the analytical ability required to evaluate and demonstrate the effectiveness of proposed systems.

include: analyze and define requirements for advanced detection systems and determine broader parameters for such systems, establish their feasibility, analyze long range missile detection systems and specify optimum configuration on the basis of utility, performance, cost and delivery.

Write in confidence to E. M. George,
Supervisor—Personnel Administration

Missile Detection Systems Section
HEAVY MILITARY ELECTRONICS DEPARTMENT
GENERAL ELECTRIC
SYRACUSE, NEW YORK

All of these openings are on General Electric missile and satellite detection projects and will be filled with engineers having the capability and desire to make creative contributions.



WIDE SPACED landing gear gives the J85-1 sport plane good rough field characteristics

be used for flying gliders and for home aviation.

Powerplant is a single Continental C-90 12F engine developing 45 hp at 2,625 and 90 hp at 3,475 rpm.

Design Details

The wings are constructed in three sections. The two outer center section of 54 ft. span, carries the leading gear, aero controls and tailbooms which meet. The single span outer panels have an auxiliary outboard which is covered by a plywood with the grain running diagonally to form the tension mast. The rest of the wing surface is fabric-covered. The aerofoils have plain center section.

Maximum landing nose is 5 ft. 6 in. with a large fronted plastic plate design, allowing a good all-round view. It can be packed back or completely removed as desired.

Tension spar of the rudder is made of plywood in the ribs and trailing edge. Rudder is fiber-cased.

The elevator has a single spar with a short leading edge. It is hinged to the fuselage in front position. It is covered with plywood and fitted with a trim tab which can be controlled from the cockpit.

Two-wheel landing gear has hydraulic brakes. Rubber sprung tail wheel is coupled to the rudder and in the event of large side loads automatically locks into the rudder, and also allows the aircraft to be turned around and moved into position on the ground.

The landing gear has lowered springs which are bolted to a heavy metal base and tubing in the center section of the wings.

Overfender is currently completing the first production run of the J85-1 and several models are expected to be

JOB 5 Performance

(With propeller of 45.25 in. pitch and 72 in. diameter)

Maximum speed	312 mph
Cruising speed	99 mph
Rate of climb (with gear weight of 4,200 lb.)	707 fpm
Service ceiling	10,040 ft.
Range	398 mi.
Duration of flight	4.1 hr.
Takes off distance over an elevation of 4,928 ft.	1,118 ft.
Crosswind	400 ft.
Minimum speed	41.8 mph
End consumption at cruising speed	4.71 mph
Fuel capacity	395 gal.
Take-off version	Two-seat version
Gross weight	1,316 lb.
Empty weight	944 lb.
Useful load	372 lb.

* Including full instrumentation.

HUMAN FACTORS SPECIALISTS

Based on the premise that the present systems of future space programs must be designed to fit the needs of men and automatically with the requirements of CONVAIR ASTRONAUTICS, two men have been appointed as Human Factors Specialists on the AFMIS and Space space systems. These men must be educated and trained in Psychology and Engineering to accomplish research in the fields of mobility and space flight, and have a knowledge of the Federal air classifications and technical training.

If qualified, write Mr. T. W. Mills,
Engineering Personnel Administrator,
Convair Division 120-10.

CONVAIR ASTRONAUTICS

Convair Division 120-10
**GENERAL
DYNAMICS**
500 Kearny Villa Road,
San Diego, California



Let's look at it from your point of view, Mr. Engineer



Yours is demand, there's no doubt about that, and rightly so. What's old, after all, needs revision and renewal for your talents. Many firms offer challenges, and it's hardly one that doesn't have opportunities.

Do you believe in the future? Do you believe in the future? Are you a creative engineer? Then when it comes to what we do, Raytheon Missile Systems Division, how do you see it going?

We believe we have something more to offer. It's a management policy. It's unusual in that it's based on the premise "We believe in talents." We look for men in plain existence who you would want to look more like us and a dozen others. We feel that Raytheon Missile Systems Division's management has made a policy that is reflected in what is offered to us.

If we opportunity you seek, there's certainly basic Raytheon Missile Systems Division, in the largest division of the Raytheon Company, offers one of the finest growing divisions to us. We think this fact is proof of our policy.

If it's a challenge you seek, Raytheon is the world's only purely electronic aerospace and prime contractor to missile systems systems. The challenges here are unlimited.

Perhaps it's better living conditions that would be a great driving factor. New Rayland offers recreation, transportation, and excellent educational living, and we can do the best for you in this area.

So we have the many things you're probably looking for in a position — look no further. We have a policy that allows for you to — to create a climate for talents. More like the one you're looking for, probably. Perhaps that, and the other reasons we've stated, are reasons enough for you to investigate our company thoroughly. Do you need that recommendation?

Call collect, Elkhorn 4-8887 for further information, and an interview appointment. Ask for Mr. Jerry Morris. If you prefer, address your postcard or letter to Mr. Jerry Morris, Professional Staffing Manager, Raytheon Company, Bedford, Massachusetts.

Credit Design Engineers... with experience in design of high-speed switching circuits, pulse techniques, and computer logic in one or more of the following areas: servo, logic, memory, data processing, FDM, PCM, PDM, and facsimile circuitry.

Site Reading Engineers... with experience in high-speed, one-to-many-to-one format techniques, logic design, conversion and data storage. Should have thorough knowledge of tape reader techniques, digital, serial, and digital-computer design.

RAYTHEON

MISSILE
SYSTEMS
DIVISION

... creates a climate for talents.



THREE-VIEW of XB-47 prototype shows large cockpit canopy with wide view.

now for demonstration proposals by spring 1960. Free flight data and plans of the aircraft will then be available to the flying laboratory operator who was for the competition was used and possibly be around \$7,700 (\$3,000 Swiss franc). Trim and load scales, two altimeters, tachometer, rate of climb indicator, compass, impact indicator, of pressure gage, oil temperature, engine fuel pressure, gage and fuel quantity indicator, for extinguisher and first aid kit are included in the standard equipment.

Modifications Planned

Next step in the XB-47 series will include the following modifications of the first prototype:

- Landing gear supports to three passengers including the pilot will be two (at front) and one paragraph behind the adjustable front seats.

- Landing gear will be false-centered steel tube construction with track for nose glider.

- Extra cockpit will have nose wheel landing gear.

- One-piece wing wrapped with film.

- Four-leaflet tailplane will be a Lycoming 350-400 engine rated at 175 hp.

The aircraft will comply with normal categories of Civil Air Regulations for three passenger aircraft (gross weight 1,245 lb. or more) additional load of 300 lb.) and with the U. S. regulations regarding the purpose for which the plane may be used, that is, for nonstop commercial transportation of passengers, private flying, business flying and demonstration flights."

The aircraft remains (gross weight

creativity



untrammeled
IN KANSAS

Out here in Kansas there's still space to breathe. You can still drive your car to work in minutes, think in a free creative environment on dynamic projects undimmed by soot or smog.

Wake up to the best of Mid-American living in Wichita, where your family will enjoy superior housing, excellent schools and churches, ample cultural and recreational facilities, and the bracing, healthful climate of four true seasons.

Here YOU, as a senior engineer or scientist, will find assignments to challenge your fullest powers of creativity in electrical research, antenna design, configuration design, propulsion and guidance systems for existing and future air-space systems... with plenty of opportunity for advancement.

CONTACT
BOEING AIRPLANE COMPANY, WICHITA 1,
KANSAS, ATTN: MR. MELVIN VOBACH,
DEPT. AWA.



relax and think . . . in Kansas

BOEING • WICHITA

ELECTRONICS ENGINEERS



It's Time To Take A New Heading On your Course With The
World Leader In Continuous Wave Doppler Navigation Systems

The "Instrument" of space are the electronics engineers. Ryan Electronics needs scores more of them right now.

Electronics engineers to probe space and move into space and find out how to adapt the Doppler principle to man's farthest reach into the future. Electronics engineers to exploit Ryan's multi-million dollar Navy and Army contracts and other challenging projects. Electronics engineers to keep a jump ahead of each new demand of America's major military aircraft and space projects. Ryan's leadership in D-W



Ryan Electronics, Dept. 3, 5620 Kearny Mesa Road, San Diego 13, California.

RYAN ELECTRONICS
DIVISION OF RYAN AERONAUTICAL COMPANY TORRANCE, CALIFORNIA SAN DIEGO, CALIFORNIA

JOB 5 Dimensions

Span	30.2 ft
Length	36.8 ft
Height	6.3 ft
Wing area	129 sq. ft
Wing loading	1.16 sq. ft
Inter-test version	19.2 sq. ft
Power loading	1.16 lb/sq. ft
Inter-test version	14.7 lb/sq. ft
Aspect ratio	1.04

1,540 lb. may be used for training and instruction purposes, competition and record flights, trial and test flights, and basic research" according to information group 4 of the German aircraft construction regulations.

Flight data obtained so far agrees with the calculated performance within a maximum variation of plus or minus 8% according to designers.

PRIVATE LINES

Independent safety research organization has been formed by A. Howard Hulbrook, who has resigned after five years as director of the Aviation Crash Injury Research Council of Cornell University, sponsored by the Flight Safety Foundation. The new organization will have temporary headquarters at Calveret, Ariz., and is aimed at accident and injury prevention in the avionics, space and automotive fields.

Allied International Corp., of New York City, has been appointed distributor of the Sikorsky S-61 helicopter in the United Arab Republics, Lebanon, Kuwait and Iraq, according to A. L. Pitti Patriarchi. Allied vice president, Patriarchi is the commercial division of the Army's H-3D Barac.

United Steel Companies, Inc., of Sheffield, England, is planning construction of an aero-plant with its headquarters in the U.K. The company's executives and representatives in Austria will be designed for light aircraft only. Local council approval is for five years.

Polish Lightplane Details

Wasow-Polak has released basic operational data of PZL-102 Kow (Black Swift) and Bies (Dawn) all-metal light planes.

The 45hp Jumo 521, designed primarily for sports and "tourist" use, is 23.5 ft. long and has a 27.8 ft. wing span. Empty weight is 1,300 lb., top speed is 182 mph, and range is 451 mi.

The 65hp Bies has a 27.8 ft. long and has a 34.5 ft. wingspan. Empty weight is 1,660 lb., top speed is 195 mph, range 465 mi.

* DIVERSIFICATION



* Another reason to
JOIN ROHR, the company that's known by the
PEOPLE it keeps.

Diversification means many things to the people who are contributing their talents to Rohr's unchallenged role in the world's largest producer of components for flight. It means a variety of interesting assignments and the opportunity for personal growth and professional advancement. Diversification has led to Rohr's record backlog of nearly a quarter billion dollars — 60 percent on commercial contracts — assuring unparalleled stability.

Rohr's diversification is symbolized by the jet power package pictured above, consisting 3000 Rohr-built parts, and the Rohr-developed honeycomb bonding process shown below.

Rohr invites inquiries from one who can contribute to the company's continued leadership in the aerospace industry. Write to Mr. J. L. Harrel, Industrial Relations Manager, Rohr Aerocraft Corp., P.O. Box 878-A, Chula Vista, California.



WORLD'S LARGEST
PRODUCER OF
COMPONENTS FOR FLIGHT



Chula Vista & River City, Calif.

Systems Engineers...

You're needed to analyze a

TOTAL AIR DEFENSE CONCEPT

RCA, the world's electronics leader, offers men of scope the opportunity to participate in a program dedicated to the enhancement of our Air Defense capability. We are seeking individuals who have the ability to analyze the total concept of Air Defense as a system and to evaluate the criteria evaluation necessary to maintain adequate capability. The men who qualify must be imaginative, yet practical, and most, those all, seek the stimulation which only systems engineering in its broadest aspect can offer.

A degree in Electrical Engineering, Physics, or Mathematics is required, plus engineering experience, preferably in the following fields:

- Systems Design
- Systems Evaluation
- Systems Integration
- Operations Research
- Computer Technology

Salaries will be commensurate with individual experience and job responsibility. Assignment is in the Research, Engineering, or a Management capacity. Of course, RCA's splendid benefit program will be available and major relocation expenses will be assumed by us. Qualified applicants may send a detailed résumé to:

Mr. J. H. Barnes
Technical Employment
RCA Service Company, Dept. Y-15A
Chevy HBL
Concord, N. New Jersey



RCA SERVICE COMPANY
A Division of Radio Corporation of America

WHO'S WHERE

(Continued from page 21)

Changes

Barrett Corp. Burlingame, Calif., has announced the following appointments: C. J. Gilbert, director of subcontracting; B. Tidmarsh, director of administration; Jim McLeod, director of contract administration.

Dr. Leslie G. A. Neumann, manager of development services, has joined the Engineering Division of Bell Telephone Company, Denver, Colo.

Jack M. Oberlin, assistant to the president, West Lok Corp., Anderson, Calif.; Fred H. Hartman, engineering supervisor, The Fisher Corp., New York, has been appointed Senior Leader, Director of engineering and research, Defense Products Division, Fairchild Camera and Instrument Corp., Great Neck, N. Y.; Alvin Robert Breslow, R&D marketing manager for the division.

Dr. S. D. Dorn, manager of Prod. and Planning, Marketing Division, Division of Prod. Victor, Newport Beach, Calif.; Mac Dr. R. R. Redworth, head of the Operations Research Section in the Army Technical Operations Control (ATOTC) project, Armstrong, Computer Operations, Armstrong W. Wells, director of engineering, Allis-Chalmers, Inc., Milwaukee, Wis.

Dr. Gerlin E. Miller has joined the senior staff of National Engineering Services Co., Pasadena, Calif.

Vernon W. Wilson is a research associate in the staff of Flight Safety Foundation, Inc., New York, N. Y.

James G. Jorgens, manager, Acoustic test Division of Tennessee Corp., Dallas, Calif.

Dr. William Thomas, product development manager, Acoustics Division of Chase, Acoustics Research Inc., Dallas, Tex.; T. W. Shandoff, director of quality control and service, Semiconductor Division of Chase, Vicksburg.

Thomas Roddick, assistant marketing manager, Photo-Vacuum Division of Photofab, Inc., Vicksburg, Miss.

Frank M. Wilson, manager, Prod. Dynamics Division, Lockheed, Burbank, Calif., Vicksburg, Miss., Dallas.

Robert L. Jones, corporate marketing director, Lorch Corp., El Cajon, Calif.; Dr. S. A. Kastner, manager, and Ned A. Shandoff, director of the Special Prod. Div. Division of Lorch Corp.

General Konner, product manager, operations, Defense Sea Dept., Division of Naval Ordnance Corp., San Diego, Calif.

Red F. Wiers, organizing consultant, Defense Electronics Department of Stand Engineering Inc., Philadelphia, N. J.

Dr. Joseph E. Biss, director of the Research and Technical Information Dept. Vice Defense Sea Corp., Calif.; Vice President, Dr. K. K. Kao, general manager of the San Jose, Calif., Calif. Unit of the Electron Tube Division.

Donald C. O'Connor, assistant to the vice president, engineering and research, General Precision Equipment Corp., New York, N. Y.

Sure, we're proud of what they're saying in consumer circles...

BUT, MR. ENGINEER, DID YOU KNOW...

... that people are talking up Magnavox in the military and industrial fields as well? That we not only make the world's finest stereophonic high-fidelity, studio photographic and television instruments, but do vital work for some of the principal names in government and industry both here and abroad? We see, in fact, currently engaged in advanced electronic activity covering the broad areas of communications, airborne radar, missiles, anti-submarine warfare systems and data processing equipment. And the growing demand for our services in every one of these fields has made it necessary to put in a call for more creative talent. If you're an engineer with a yen for challenge... if you like to work with interesting, capable people... and if you very definitely DON'T want getting lost in the crowd... look into Magnavox. There's a promising future ahead.

*Please Disk Easy (left), of record at
Beaumont HBL in Port Wayne or write
us, using for complete information.*



FORT WAYNE, URBANA, ILLINOIS, LOS ANGELES, CALIFORNIA

Magnavox



COMMUNICATIONS



RADAR



DATA HANDLING



ASW



MOBILES

THE MAGNAVOX CO. • DEPT. 222 • Government and Industrial Division • FORT WAYNE, IND.

AVIATION WEEK, January 18, 1962

GPL

has current openings as described below, in Radar Navigation, Communication, Data Processing and Closed Circuit Television Systems.

SALES APPLICATIONS ENGINEERS

Requirements or Sales experience background. To contact management for further information about qualifications, regarding the possible application of CPT systems. Nonstop customer service.

SERVICE SUPPORT PLANNER

To be responsible for the planning, maintenance, and follow-up of parts programs, including spare parts, field service, customer contacts, etc., plus a wide range of complex electronic systems. Seven years of experience required.

CONTRACT ADMINISTRATORS

To be responsible for military electronic contracts of all types. Several years experience required, plus education at the college level. Military contract experience mandatory, or military experience desirable.

GPL DIVISION**GENERAL PRECISION INC.**

13 Rockford Road

Pleasantville, New York

Please write or telephone, indicating career desires, to:
Warren A. Reilly
Manager
Human Resources
GENERAL PRECISION INC.

Engineers and Physicists**Your talent and time go further
in Minnesota, land of opportunity****Send for free booklet
with all the facts**

For you can use your time planning a change in employment, you'll be interested to know that in the Twin Cities area there are many opportunities for you to move up and forward. Many other opportunities are available in the area and throughout the state. Minnesota is the land of opportunity. For more information, contact the Minnesota Department of Economic Development, 1000 University Avenue, Suite 1000, St. Paul, Minnesota 55101.

Or you can take an off-the-shelf opportunity in Minnesota. You can do this by writing to the Minnesota Department of Economic Development, 1000 University Avenue, Suite 1000, St. Paul, Minnesota 55101. Many opportunities are available in Minnesota for advanced training, and industrial products, top

quality products according to their original designs and unique concepts.

Right now, in the Minneapolis-St. Paul area, there are opportunities for you to move up and forward. Many opportunities are available in the area and throughout the state. Minnesota is the land of opportunity. For more information, contact the Minnesota Department of Economic Development, 1000 University Avenue, Suite 1000, St. Paul, Minnesota 55101. Many opportunities are available in Minnesota for advanced training, and industrial products, top

quality products according to their original designs and unique concepts.

Right now, in the Minneapolis-St. Paul area, there are opportunities for you to move up and forward. Many opportunities are available in the area and throughout the state. Minnesota is the land of opportunity. For more information, contact the Minnesota Department of Economic Development, 1000 University Avenue, Suite 1000, St. Paul, Minnesota 55101.

Right now, in the Minneapolis-St. Paul area, there are opportunities for you to move up and forward. Many opportunities are available in the area and throughout the state. Minnesota is the land of opportunity. For more information, contact the Minnesota Department of Economic Development, 1000 University Avenue, Suite 1000, St. Paul, Minnesota 55101.

Mr. G. P. Sartori
Manager, Employment
Marketing Division, General Mills
2000 Franklin Avenue, Dept. 1000
Minneapolis 14, Minnesota

Name _____

Address _____

City _____ State _____ Zip _____

MECHANICAL
DIVISION**MANAGER
Structures
Laboratory**

A unique opportunity for a highly qualified stress engineer to supervise the Structures Laboratory of one of the country's leading R & D facilities.

Position demands an extensive background in static and dynamic testing, a thorough knowledge with most of the art in application of loadable specimens, pressure and other environments to quasi-static, dynamic and management experience. A knowledge of required equipment and facilities is essential.

Position A major one centrally located.

All replies will be held in strict confidence. Please write to Box P-100, Aviation Week, Chas. A. Attn. Mrs. P. O. Box 12, N. Y. 100-26.

**MANAGER
OF RATE PROCESSION FOR
MAJOR CERTIFIED AIRLINE**

Major corporation and worldwide, the authorized rate processor for the major certified airline. Position involves working with three domestic business units and one international unit. This position offers unique growth and opportunity. It is a unique opportunity to work with a major corporation and to be involved in the development of a major airline.

Position requires a college degree in aeronautical engineering, and a minimum of three years experience in the field of aircraft rate processing.

For further information, contact Mr. J. C. Johnson, Manager, Rate Processing Department, Box 100, Aviation Week, Chas. A. Attn. Mrs. P. O. Box 12, N. Y. 100-26.

**SOPHISTICATED
ENGINEERS**

A NEW STATE OF THE ART

We have succeeded in the development of a highly sophisticated electronic system for the control of aircraft. This system is unique in the field of aircraft control. We are now seeking qualified engineers to help us develop this system. The position requires a minimum of three years experience in the field of aircraft control, and a knowledge of aircraft systems.

Richard J. Sharp Associates
1000 University Avenue, Minneapolis 14, Minnesota 55101

**INERTIAL
SYSTEMS
DEVELOPMENT**

There are opportunities at Honeywell Aero for the engineer or scientist who is interested in participating in this growing field of technology. While specific inertial systems experience is desirable, you may also be qualified in your background and/or related experience for activities in the inertial systems development at this time. Specific openings include:

STRUCTURAL ANALYST

Mathematician or engineer working background in aircraft analysis, aircraft structures, aircraft design and related techniques. To carry out analysis of inertial systems components, including inertial sensors.

**DATA SYSTEMS AND
LOGIC DESIGNER**

Position with digital logic designer experience or equivalent, and the ability to conceive, design, and implement systems to perform various tasks including layout design and related parameter specification.

ELECTRONIC ENGINEER

Electrical engineering degree plus experience in aircraft systems and aircraft electronic development. To serve as a lead engineer and supervisor for our own group and as a technical leader in the development of aircraft systems and aircraft electronic systems.

ENGINEERING PHYSICIST

Physics with extensive and demonstrated understanding of mechanics, optics, and energy to apply to aircraft inertial systems of aircraft and aircraft design.

To discuss these and other openings, please call 652-3300, write or phone R. E. Atwell, Chas. A. Attn. Mrs. P. O. Box 12, N. Y. 100-26.

Honeywell

AERONAUTICAL DIVISION
2000 Franklin Avenue,
Minneapolis 14, Minnesota

To apply, send resume to: Richard J. Sharp Associates, 1000 University Avenue, Minneapolis 14, Minnesota 55101.

**some straight talk to
engineers aiming at
management**

from General Electric's
Defense Systems Department

Opportunities to demonstrate management ability as a significant scale are often hard to locate.

However, engineers looking toward engineering management goals will find unusual opportunities for attaining them in our work at GE's Defense Systems Department, since Military Systems Programs are a prime function of the operation.

A number of programs are now being initiated. If you are technically qualified to pull your weight in assignments in Systems Engineering, you can move ahead into management functions in your present advance.

These assignments assignments require the exercise of technical leadership from proposal effort and determination of technical needs through delivery of equipment.

The work progresses into supervision of system installation, establishment of system test criteria, and plans and schedules for equipment and sub-system design, work to be performed. (No equipment design or fabrication is assigned in at DSD.) As your technical management abilities are demonstrated, large areas of additional responsibility will be delegated.

Assessments Openings Inc.
Systems Engineering - Systems Test
Systems Synthesis - Systems Logistics
Systems Maintenance - Guidance/Electronics
Infrared Guidance & Navigation - Basic Guidance
Information Theory & Noise - Space Physics
Operations Analysis - Engineering Writing

Please forward your resume in confidence,
including salary requirements,
to Mr. E. A. Smith, Dept. 1-3.

DSD DEFENSE SYSTEMS DEPARTMENT
A Division of the Defense Electronics Group

GENERAL ELECTRIC
300 North Geddes Street, Syracuse, N.Y.

LETTERS

Aviation's Significance

The letter in AVIATION WEEK for Dec 12 (by Mr. H. N. V. Cope, regarding the "Final Harbor Fleet Fund") has many points in its favor.

But for the purposes the caption made was point 121, "After Defense Week, via its propaganda channel it can stop, tell the U.S. citizens the R&D story."

There is the usual advertising, that which the industry could do to "improve" the industry's public.

Despite the fact that the industry has been in operation for 37 years, the majority of Americans are still acquainted with the captioning and the meaning of the aerospace. Here is a place where a considerable part of the aerospace industry's propaganda associated with the aerospace industry, the manufacturers, defense suppliers, flying clubs should tell the story at every opportunity. Tell the story in schools, in clubs, among their flying groups, in their clubs. The more people become aware of the true significance of the aerospace, the less chance for budget "conservatism" to allow a program to develop as one believes, suggested by the R&D story. I believe, suggested by me in the statement, that the aerospace industry has been fully reliable and appropriate, as proposed to us in 1946.

We need to educate the public to the vital importance of the aerospace, and urge early to the deepest necessity for the R&D.

John W. Wernham
Indianapolis Ind

B-70 Comments

The most obvious (AW Dec 7, p. 21) and latest in the B-70 opinions recommends the B-70 as the best aircraft for future operations. I have accepted this order of things as has but few others concerned on accelerating development and production of the long-range program.

With the B-70, we will be the earliest to benefit from the technological advances of the SAC, that is, low-level operational flying within the maximum limits of the United States at altitudes ranging from 50,000 to 60,000 ft. This will be the most effective way to keep bombers away from the enemy only at high altitudes. There can be only one game suggesting that this is the only way the SAC can defend itself, could point to some territory with no measure of success.

The advantages of the B-70 over the B-52 are many. SAC has the problem of getting practical experience with respect to high altitude penetration, and it appears that the current tactic can be but a risk-shift method to increase the percentage of penetrations, with questionable results in the long run.

If we are to resort to such tactics in attempts to increase the effectiveness of the B-52, why not just make purposes an developing a superior SAC which might greatly increase the percentage of penetrations at very high altitudes and at very

striking. Week emphasizes the expansion of its readers on the issues raised in the magazine's editorial content. Address: 2200 B. Alfred St., New York 26, N. Y. Yes to keep Britain under 5000 pounds and give a greater identification. We will get greater identification because the sources of interests will be withheld on request.

High speed is speed of present number. Yes, this will be important, but a successor to the B-70 is a must. We must have a successor to the B-70, and the B-70 is a must. We must have the desired speed, more maneuverability of an unpredictable air force, and to attempt to stop the operational command superiorities of flight may be an invitation to disaster. There are no short cuts to an adequate defense and offense.

Reserve P. Moore
New York, N. Y.

Serious Mindedness

Regarding B-70 defense, etc., I would like to suggest "Aviation Equipment" from AW last (AW Jan 6, p. 9).

Your exposition was a sore lesson in narrow reading. As the article proposed you made right. Mr. Holt noted toward the beginning: "We were over it, really." Mr. "A" was right, too, when he said, "I have no time."

I myself, as far as I can see, and the rest of us, are in a quandary, and it is not for a tiny fix with his courage and original forethought (Mr. Holt), can do. One lesson: One believes in the B-70 next year would be caught with surprise, and one would give himself another and third try.

Granted, we can't always be old guys name "big head" as "overseer group," doesn't go, but in consolidating program and setting up systems for the SAC's role, we must be effective.

Having had off and on half of one life (10 years) outside of the United States, I know the American people by and large are serious about our defense and not to be taken for granted. We are under no circumstances.

One last little thing: "We are under no circumstances."

I. E. Holt, Vice president in charge of destroying the name, such name ideas, time and place of usefulness (which most of us have had).

2. Major (which we push) A. I. Holt, would be glad to give another date if we prefer.

And finally, Mr. "A." the B-70 committee has had an effect on me.

Howard W. Metzler
Defense Department
Headquarters Standard Division of
United Aircraft Corp.
Brentwood, Conn.

Mercury Recovery

We read your article "Last Month Capsule Knapsack" which appeared in the Dec 14 (p. 30) issue of AVIATION WEEK. We noted that, according to

your article, the capsule was equipped with the solid band, dry marker and radio beacon from the Mercury recovery system and that the capsule was shot down at a point 30 miles from the last landing PTV sighted. The radio beacon returned to the SARMAT system 34 min after launch." The radio beacon returned to the SARMAT system (Korolev and Reshetov and Hanning) between 30 min and 40 min and 34 min after launch.

We were considerably surprised. But Aviavteg was correct, such a misleading possibly even erroneous statement such as "last contact was made when a passing Navy Lockheed PTV sighted the ground dry marker." As a matter of fact, this was the last visual contact.

From the data of NASA, we were informed that our SARMAT equipment were on the site, as scheduled, when the capsule was at 30,000 ft altitude, and first contact with the capsule was receipt of the SARMAT signals. At approximately, the signal was picked up by the SARMAT at a distance of 54 km by a Navy Lockheed PTV, which was on the site specifically to pick up the SARMAT signals. Hanning signals were received at a distance of 60 km from the capsule location. The signals were also picked up subsequently by other aircraft located in 2 or 3 areas of the ground for closer and continuous. We were informed that no aircraft at higher level was within visual sight of the capsule and as a matter of fact, flight and altitude were diverted to the area by the last aircraft to pick up the SARMAT signals. The PTV was the last aircraft to receive "last signal" in the new sense of the word but remained in that area to make radio contact and was directed to that area as a result of the hanning signals received from SARMAT.

In this letter, we are going to set the record straight. The capsule should not have been shot down where credit is due. For the past several years SARMAT has been standard equipment with all NASA crews except United States. The systems of test article and personnel in Canada, as those of the United States of America, should receive every SARMAT because for me in conspiracy.

We are very proud that our SARMAT equipment is being used so successfully in the United States, the removal of sonic boom, the use of the capsule and so on, we consider is the missile program. We would like to see such precise equipment become the standard component in the United States as inventory of test personnel. We believe that many improved dollars which have been spent in present time in the development of the capsule have been used, along with the strong probability that some of us would not have been test.

We are, therefore, anxious that all credit be given to SARMAT, which made credit a due, and under the dispensability and necessity of the capsule we would like to thank the chairman of your subcommittee.

Edward L. Schlossberg
Manager, Publications & Public Relations
Space and Astronautics, Inc.
Troytown, N. Y.

To assure a new order
of reliability

MICRO-MODULE EQUIPMENT



The micro-module is a new dimension in military electronics. It offers answers to the urgent and growing need for equipment which is smaller, lighter, more reliable and easier to maintain. Large scale automatic assembly will bring down the high cost of complex, military electronic equipment. Looking into the immediate future, we see a tactical digital computer occupying a space of less than two cubic feet. It will be capable of transmitting, receiving



RADIO CORPORATION of AMERICA

DEFENSE ELECTRONIC PRODUCTS
CAMDEN, NEW JERSEY

ADVANCED FUEL MANAGEMENT ...FROM SMI

The requirements of accurately tanking missiles with propellants is but one of the areas of fuel management in which Servomechanisms, Inc. has demonstrated capability. Propellant utilization and thrust control are other areas in which SMI has developed highly accurate and precise measuring and control systems.



SMI's LOX Tanking Computer, which has been in production for the past year, accurately measures, controls and indicates the level of liquid oxygen in missile tanks. Loading is accomplished rapidly and accurately due to a unique two-mode control system. The first mode permits extremely high pumping rates until about 98% capacity is reached. The second mode then takes over and controls a precise proportioning valve which adds the necessary LOX to fill the tank within 0.1% accuracy. The second mode also provides continuous topping, thus compensating for LOX evaporation losses during standby.

SMI has currently in development, more advanced fuel management systems to meet the increasingly complex requirements of the next generation of missiles and spacecraft. SMI would welcome the opportunity to discuss and propose solutions to your fuel management problems. Write for descriptive literature.

Positions are available for qualified engineers and scientists in the areas of:
Systems Synthesis and Analysis—Project Management
—Qualification and Environmental Test Engineering—
High Vacuum Deposition Techniques.



LOS ANGELES OPERATIONS: 12500 Aviation Blvd., Hawthorne, Calif.

MECHATROL DIVISION: Westbury, L. I., New York

RESEARCH AND DEVELOPMENT CENTER: Goleta, California